FINAL STUDY REPORT

LOWER BARKER HYDROELECTRIC PROJECT

FERC NO. 2808

Prepared for:

KEI (Maine) Power Management (III) LLC
Lewiston, Maine

Prepared by:

Kleinschmidt

Pittsfield, Maine
www.KleinschmidtGroup.com

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1.0 INTRODUCTION

The Lower Barker Project (FERC No. 2808) is on the Little Androscoggin River just upstream of its confluence with the Androscoggin River in Auburn, Maine (Figure 1). KEI (Maine) operates one hydroelectric turbine at the Lower Barker Project that can produce up to approximately 1.2 megawatts[1] of clean, renewable energy. After passing through the turbine unit, water discharges back into the Little Androscoggin River from a small powerhouse approximately 3,000 feet downstream of the dam. A minimum flow of 20 cubic feet a second (cfs) is conveyed to the bypassed reach of the Little Androscoggin River from a gate at the dam, which also provides downstream fish passage.

The Federal Energy Regulatory Commission (FERC) issued the original license to operate the Lower Barker Project on February 23, 1979, for a period of 40 years; the license expires on January 31, 2019. KEI (Maine), the current licensee, is applying for a new license to operate the Lower Barker Project; the license application must be filed with FERC on or before January 20, 2017. KEI (Maine) is using FERC's Traditional Licensing Process (TLP).[2] KEI (Maine) filed a notice of intent and pre-application document (PAD) to initiate the relicensing of the Lower Barker Project on January 31, 2014. The PAD provided a complete description of the Lower Barker Project, including its structures, operations, and potential resource issues and identified study needs and resource issues to address during the relicensing. KEI (Maine) distributed the PAD to federal and state resource agencies, local governments, Native American tribes, and others thought to be interested in the relicensing proceeding. KEI (Maine) held a joint agency and public scoping meeting and a site visit on July 30, 2014. KEI (Maine) also held a meeting with the fisheries agencies on December 5, 2014, to discuss goals for fisheries restoration, fish passage, aquatic habitat in the Little Androscoggin River, and agency study requests, which were received in the spring and summer of 2014 (Appendix B).

[1] Approximate maximum instantaneous generation capacity.
[2] As defined by Title 18 of the U.S. Code of Federal Regulations (CFR), Part 4. FERC approved KEI (Maine) to use the TLP on March 19, 2014.

Scale: AS SHOWN	KEI (MAINE) POWER MANAGEMENT (III), LLC LEWISTON, ME	FIG.
Project No: 705074.01	LOWER BARKER HYDROELECTRIC PROJECT (FERC NO. 2808)	
Filename: see margin	Project Location	
Drawn By: RSR		
Date Drawn: 02-17-2016	Kleinschmidt 141 Main St., PO Box 650 Pittsfield, Maine 04967 Telephone: (207) 487-3328 Fax: (207) 487-3124 www.KleinschmidtGroup.com	1

Path: G:_Client_Data\KEI\Lower Barker_MXD\ProjectLocation_for ISR.mxd

Source: ESRI, Kleinschmidt, KEI

KEI (Maine) issued a proposed study plan (PSP) on March 6, 2015, that outlined studies to collect baseline information about important resources identified during scoping and consultation in 2014. KEI (Maine) then developed a final study plan and submitted it to the stakeholders and FERC on June 5, 2015. The final study plan included studies of (1) water quality, (2) benthic macroinvertebrates, (3) juvenile American eels, (4) bypassed reach aquatic habitat and minimum flow, (5) historic properties, (6) cultural resources, and (7) recreational needs.

Based on discussions with the agencies in December 2014, and as noted in the Final Study Plan, study requests by the Maine Department of Marine Resources (MDMR), National Marine Fisheries Service (NMFS), and the U.S. Fish and Wildlife Service (USFWS) related to downstream fish passage effectiveness testing were not adopted because KEI (Maine) is planning to improve the existing downstream fishway at the Lower Barker Project during the relicensing process. KEI (Maine) met with NMFS on May 12, 2016, to discuss downstream fish passage at the Lower Barker Project and potential modifications necessary to improve downstream fish passage. KEI (Maine) will continue to consult with the fisheries agencies on appropriate modifications during the design phase.

NMFS requested two studies related to the design of an upstream fishway at the Lower Barker Project: a radio-telemetry study and a tailrace hydraulics study. KEI (Maine) agreed with NMFS that effective upstream fish passage at the site could become important in the future and these two studies may eventually be needed. KEI (Maine) noted in the final study plan that conducting these studies as part of the relicensing would not be informative to the Draft License Application and may need to be done later as part of potential fish passage restoration in the watershed. The fisheries agencies generally agreed during the December 5, 2014, meeting that it may be appropriate to move forward with the development of fish passage measures as a post-license compliance measure, if and when fish passage is prescribed or an active fish passage restoration plan is implemented by the stakeholders. There are eight dams on the Little Androscoggin River, most of which have no upstream fish passage measures in place.

On November 6, 2015, KEI (Maine) hosted a meeting with state and federal resource agencies to discuss progress of studies completed during the 2015 field season. KEI (Maine) then provided an initial study report to the stakeholders on May 17, 2016, describing the progress of studies completed to date and plans for completing remaining studies during the 2016 field season. KEI

(Maine) completed the water quality study, juvenile American eel study, benthic macroinvertebrate study, Phase 1 of the instream flow study, historic properties study, and cultural reconnaissance study in 2015 in accordance with the methods described in the final study plan (Table 1). KEI (Maine) completed Phase 2 of the instream flow study and the recreational needs study in 2016 (Table 1). Based upon Maine State Historic Preservation Office's (SHPO) review of the 2015 reconnaissance study report, it was determined that Phase 1 cultural study work should be conducted in 2016; the field work has been completed and the report is in progress.

Sections 2.0 through 5.0 of this report present the results of the studies of water quality, benthic macroinvertebrates, juvenile American eels, and minimum flow in the bypassed reach. The reports for the historic properties and the cultural resources studies contain confidential information and were provided to SHPO on February 24, 2016, and December 21, 2015, respectively; these reports will be filed with FERC under separate cover. The studies completed in 2015 and 2016 provide the information necessary for the stakeholders to assess the potential effects of the Lower Barker Project on the resource issues of significance which include fish and aquatics, recreation, water quantity and water quality, and cultural resources.

TABLE 1 DESCRIPTION AND STATUS OF INDIVIDUAL STUDIES FOR LOWER BARKER RELICENSING

STUDY DESCRIPTION	STATUS
Water Quality	Completed in 2015 – study report Section 2.0
Benthic Macroinvertebrates	Completed in 2015 – study report Section 3.0
Juvenile American Eels	Completed in 2015 – study report Section 4.0
Instream Flow Study – Bypassed Reach	Completed in 2015 and 2016 – study report Section 5.0
Historic Properties*	Completed in 2015
Cultural Study*	Reconnaissance Study Completed in 2015; Phase 1 Cultural Resources Study completed in 2016
Recreational Needs	Completed in 2016 – Study report provided in Draft License Application; Whitewater study scheduled for September 2016.

* These reports contain confidential information and are being provided to SHPO and FERC under separate cover.

2.0 WATER QUALITY STUDY

2.1 INTRODUCTION

The Maine Department of Environmental Protection (MDEP) requested that KEI (Maine) assess whether the operations of the Lower Barker Project affect water quality or the ability to provide for "recreation in and on the water" and "habitat for fish and other aquatic life," which are two designated uses of the waterway. Maine statute 38 MRSA §464-470 establishes the state of Maine's classification system for surface waters. The lower section of the Little Androscoggin River from South Paris, Maine, to the confluence with the Androscoggin River is a Class C waterway (Maine Legislature 1989). The quality of Class C waters must support the designated uses of drinking water supply after treatment, fishing, agriculture, recreation in and on the water, industrial process and cooling water supply, hydroelectric power generation, and habitat for fish and other aquatic life. Discharges in Class C waterways are permitted to cause some changes for aquatic life, provided that the receiving waters remain of sufficient quality to support all species of fish indigenous to the receiving waters and to maintain the structure and function of the resident biological community (Maine Legislature 1989, 38 MRSA§465).

Pursuant to the final study plan, KEI (Maine) completed lake trophic[3] and riverine monitoring during the late spring, summer, and fall of 2015 to assess baseline water quality. KEI (Maine) employed lake trophic and riverine sampling methods in accordance with MDEP's protocols (MDEP 2014a). In accordance with the final study plan, the goals of this study were to collect baseline water quality information and to use the information to assess whether the Little Androscoggin River in the Lower Barker Project area meets applicable water quality standards, affects the impoundment designated use "recreation in and on the water" or "habitat for fish and aquatic life," or affects dissolved oxygen (DO) in the project area.

Table 2 lists published Class C water quality standards for parameters monitored during this study. Currently, the state of Maine has no established standards for nutrient concentrations in freshwater, but has drafted criteria based on nutrient concentrations and environmental response indicators.

[3] A means of classifying lakes in terms of their productivity.

TABLE 2 ESTABLISHED AND PROPOSED MAINE WATER QUALITY STANDARDS FOR SELECT PARAMETERS

PARAMETER	CRITERIA	WATER CLASSIFICATION
Dissolved Oxygen	>5 milligrams per liter (mg/l) or 60% saturation; 30-day average of 6.5 mg/l in salmonid spawning areas	Class C
Iron[b]	1.0 mg/l	Statewide
Chloride[b]	230 mg/l	Statewide
Aluminum[b]	0.087 mg/l	Statewide
Total Phosphorus[c]	≤ 0.033 mg/l	Class C
Water Column Chlorophyll-a[c]	≤ 0.008 mg/l	Class C
Secchi Disk Depth[c]	≥ 2.0 m	Class C
pH[c]	6.0 – 8.5	Class C

[a]Maine Legislature 1989
[b]MDEP 2012a
[c]MDEP 2012b

To meet the designated use "recreation in and on the water," lakes and ponds must have a stable or decreasing trophic state, be subject only to natural fluctuations, and be free of culturally induced algal blooms that impair their use and enjoyment (Maine Legislature 1989, 38 MRSA§465-A). Rivers and streams (including impoundments classified as such) must also be free of culturally induced algal blooms that impair their use and enjoyment. An algal bloom is defined as a planktonic growth of algae that causes Secchi disk transparency to be less than 2.0 meters or excessive chlorophyll-a concentrations (MDEP 1996). MDEP's lake trophic sampling protocol was developed to evaluate the trophic state and to determine the attainment status of the impoundment relative to the designated use "recreation in and on the water."

To meet the designated use of "habitat for fish and other aquatic life," existing hydropower impoundments classified as Great Ponds or as rivers and streams, and downstream river and stream reaches affected by hydropower projects are required to "maintain structure and function of the resident biological community" (Maine Legislature 1989, 38 MRSA§464). To assess whether the operation of the Lower Barker Project meets this designation, KEI (Maine) studied

benthic macroinvertebrate (Section 3.0) and completed an instream flow habitat study in the bypassed reach below the dam (Section 5.0).

2.2 METHODS

2.2.1 IMPOUNDMENT SAMPLING

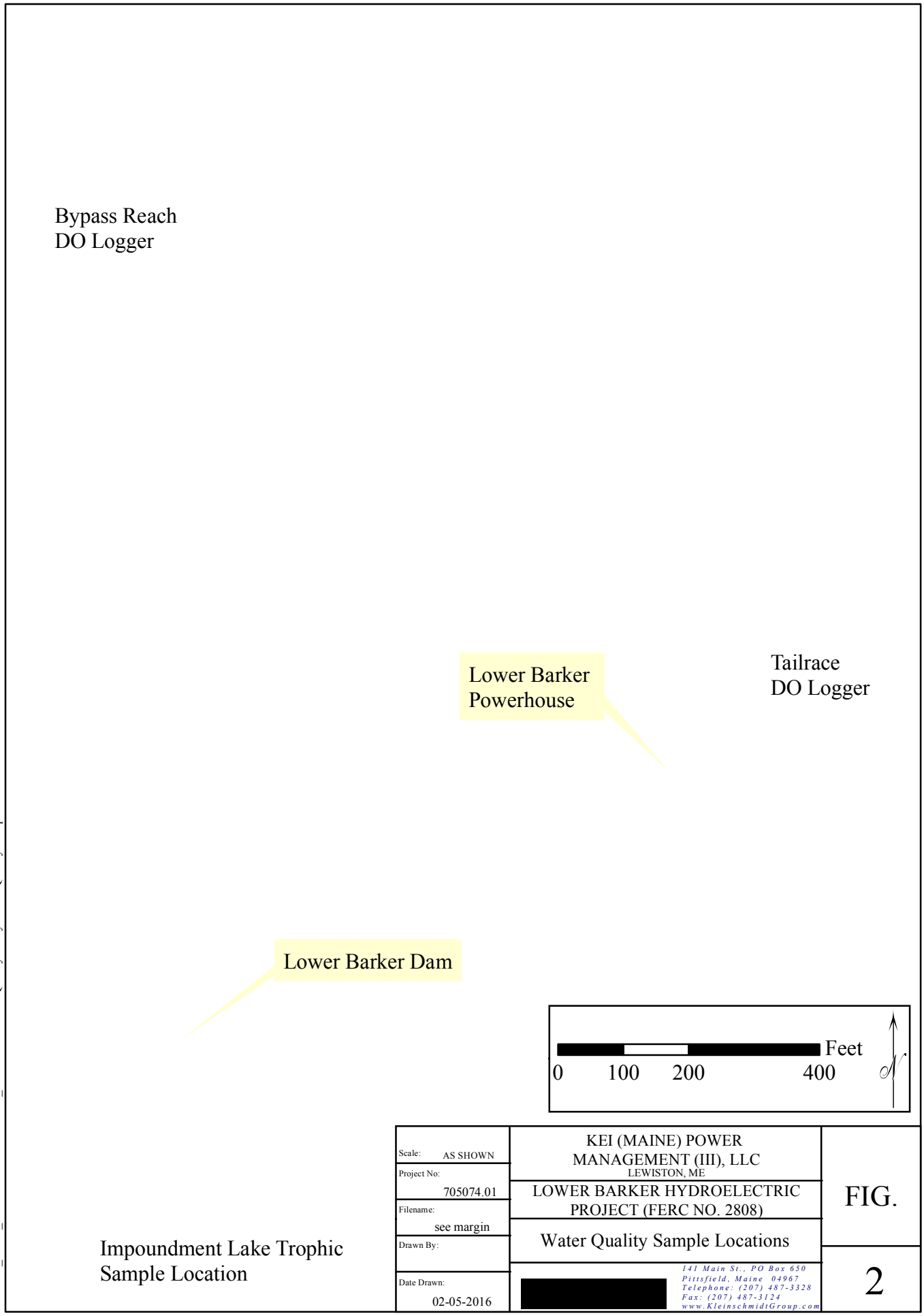
The impoundment is shallow and narrow with a total volume of approximately 150 acre-feet and a surface area of 16.5 acres. Prior to sampling, KEI (Maine) used a sounding weight to find the deepest, safely accessible spot in the impoundment to establish a sampling station. The sampling station was located approximately 200 feet (61 meters) upstream of the dam in approximately 13.1 feet (4 meters) of water. The water is nearly 30 feet deep at the upstream face of the dam; however, the sampling station was located upstream of the boat barrier because of safety concerns. A buoy was deployed to mark the sampling location for the monitoring period (Figure 2, Photo 1). KEI (Maine) collected water samples twice a month from June through October using an epilimnetic core.[4] All samples were collected in the afternoon between 12:15 and 16:05. As discussed in Section 2.3.3, the impoundment did not thermally stratify; therefore, in accordance with MDEP guidelines, each sample consisted of an epilimnetic core of the entire water column. All water samples were stored on ice and delivered within 24 hours to the state of Maine's Health and Environmental Testing Laboratory (HETL) in Augusta for analysis of total alkalinity, color, pH, chlorophyll-a, and total phosphorus (Table 3). On August 13, 2015, and in accordance with MDEP protocols, KEI (Maine) collected and submitted additional water samples to HETL for analysis of conductivity, chloride, nitrate, sulfate, calcium, iron, magnesium, potassium, silica, sodium, aluminum, and dissolved organic carbon (DOC).

During each lake trophic sampling event, KEI (Maine) measured Secchi disk transparency and water temperature and DO profiles at 1-meter intervals with a YSI 550A. The meter was calibrated in the field prior to each sampling event. The accuracy of the YSI 550A meter is ±0.3 mg/l or ±2% of reading, whichever is greater, for the DO concentration; ±2% air saturation or ±2% of reading, whichever is greater, for DO percent saturation; and ±0.3°C for temperature. KEI (Maine) also collected lake trophic data in the Upper Barker Project (FERC No. 3562) impoundment in preparation for the upcoming relicensing; however, that data is not described in this report.

[4] Small-diameter hosing used to take a sample of the water column.

TABLE 3 IMPOUNDMENT SAMPLING PARAMETERS AND REPORTING LIMITS

PARAMETER	SAMPLING METHOD	HETL REPORTING LIMIT
Secchi Disk Transparency	Water Scope	0.1 meter
Temperature	Profile	0.1C
Dissolved Oxygen	Profile	0.1 mg/l
Total Phosphorus	Epilimnetic Core	0.002 mg/l
Chlorophyll-a	Epilimnetic Core	0.001 mg/l
Color	Epilimnetic Core	5.0 platinum cobalt units
pH	Epilimnetic Core	field measure
Total Alkalinity	Epilimnetic Core	1.0 mg/l
Nitrate	Epilimnetic Core	0.05 mg/l
DOC	Epilimnetic Core	1.0 mg/l
Iron	Epilimnetic Core	0.2 mg/l
Aluminum	Epilimnetic Core	0.2 mg/l
Calcium	Epilimnetic Core	1.0 mg/l
Magnesium	Epilimnetic Core	1.0 mg/l
Sodium	Epilimnetic Core	1.0 mg/l
Potassium	Epilimnetic Core	1.0 mg/l
Silicon	Epilimnetic Core	0.50 mg/l
Specific Conductance	Epilimnetic Core	2 microsiemens per centimeter (µs/cm)
Chloride	Epilimnetic Core	1 mg/l
Sulfate	Epilimnetic Core	1 mg/l



Path: G:_Client_Data\KEI\Lower Barker_MXD\2015 Water Quality Study\Water Quality Sample Sites 2.mxd

Source: ESRI, Kleinschmidt

Scale: AS SHOWN	KEI (MAINE) POWER MANAGEMENT (III), LLC LEWISTON, ME	FIG.
Project No: 705074.01	LOWER BARKER HYDROELECTRIC PROJECT (FERC NO. 2808)	
Filename: see margin	Water Quality Sample Locations	
Drawn By:		
Date Drawn: 02-05-2016	[redacted] 141 Main St., PO Box 650 Pittsfield, Maine 04967 Telephone: (207) 487-3328 Fax: (207) 487-3124 www.KleinschmidtGroup.com	2

PHOTO 1 IMPOUNDMENT SAMPLING SITE AS SEEN FROM THE DAM

2.2.2 RIVERINE SAMPLING

KEI (Maine) discharges water that is used for generation back into the Little Androscoggin River approximately 0.57 river miles (RM) downstream of the dam, creating a small riverine bypassed reach. In accordance with the study plan, KEI (Maine) monitored DO and water temperature at two locations downstream from the dam using Onset Hobo U26-001 DO data loggers (Figure 2). One logger was on the river left[5] side of the bypassed reach approximately 1,250 feet (381 meters) downstream from the dam (Photo 2); the second logger was approximately 225 feet (69 meters) downstream from the powerhouse (Photo 3). Both DO loggers were enclosed in 2-inch-diameter perforated PVC pipe, attached with a cable, and anchored into rip-rap and tree trunks along the shoreline. The water depth at the sensors was approximately 2 to 4 feet depending on river flow and unit operations. The data loggers were equipped with a bio-fouling guard and were calibrated according to the manufacturer's specifications. The loggers were programmed to sample the DO concentration at 1-hour intervals from July 7 to September 9,

[5] All references to river left or river right are from the perspective of an observer looking downstream.

2015, during the summer period of low flow and high temperature. Data downloads and system checks were performed every 1 to 2 weeks during the monitoring period. During each download, researchers measured DO with a hand held YSI 550A meter to compare to measurements of the Onset data logger and to assess whether the data logger needed additional calibration. The data logger was accurate to ±0.2 mg/l. A barometer was installed next to the powerhouse to measure real-time air pressure data used to calculate DO percent saturation.

MDEP requested that the DO loggers be positioned within salmonid spawning areas, if present. Potential spawning areas were identified based on the presence of unembedded gravel or cobble bars in riffles or pool tail-outs during Phase 1 of the bypassed reach instream flow study conducted on July 7, 2015 (see Section 5.0). One potential spawning area was identified, and the DO logger for the bypassed reach was installed there (Photo 2 and Figure 2).

PHOTO 2 LOCATION OF DO LOGGER IN THE BYPASSED REACH OF THE LOWER BARKER PROJECT

PHOTO 3 LOCATION OF DO LOGGER IN THE TAILRACE OF THE LOWER BARKER PROJECT AS SEEN FROM THE POWERHOUSE

2.3 RESULTS

2.3.1 IMPOUNDMENT SAMPLING

Total Phosphorus

Total phosphorus is an indicator of nutrient levels and is a measurement of both organic and inorganic phosphorus in the water. Phosphorus is an important nutrient required for plant growth and is often a limiting nutrient; however, too much phosphorus can lead to algal blooms. In the Lower Barker impoundment, total phosphorus ranged from 0.013 to 0.031 mg/l with an average 0.021 mg/l (Table 4). Total phosphorus levels were below the proposed state standard upper limit of 0.033 mg/l for Class C waters (Table 4).

Color

Color is an indicator of water clarity and is a measure of the amount of dissolved organic acids and suspended matter in the water. Water with a color value greater than 25 platinum cobalt units (PCU) is considered to be colored and may have a reduced Secchi disk transparency. Throughout the sampling period, color ranged from 23 to 46 PCU with an average of 33.5 PCU (Table 4). Higher river flows (approximately 30 to 600 cfs) following spring runoff in June probably

flushed soil and organic matter into the river, contributing to the high color values observed in June and early July. Color values were lower in late July, August, and September (23 to 30 PCU) (Table 4). In addition, approximately 5 inches of rain fell in the region during a heavy storm on September 30, 2015 (NRCC 2016), which probably resulted in the increased color value of 46 PCU in the sample collected on October 6, 2015.

Chlorophyll-A

Chlorophyll-a is a photosynthetic pigment found in algae and plants and is an indicator of algal levels and biological productivity in the water. Large concentrations of chlorophyll-a can be an indication of eutrophication (i.e., excessive nutrient inputs leading to algal blooms) that can adversely affect lacustrine or riverine processes or DO concentrations. Chlorophyll-a ranged from 0.0024 to 0.0037 mg/l with an average of 0.0030 mg/l throughout the 2015 sampling period (Table 4). The concentration of chlorophyll-a in all samples in the Lower Barker impoundment was less than the proposed state standard upper limit of 0.008 mg/l (Table 4).

Alkalinity

Alkalinity is an indicator of the water's capacity to neutralize acids or buffer against changes in pH; water bodies with alkalinity values less than 10 mg/l are considered poorly buffered (MDEP 2015). Sources of alkalinity include rocks, soil, salts, and algal activity (MDEP 2015). Total alkalinity in the Lower Barker impoundment ranged from 12 to 23 mg/l with an average of 18.1 mg/l (Table 4) indicating that the water had adequate buffering capacity. Increased river flows and runoff may have contributed to the lower alkalinity values (i.e., reduced buffering capacity) in the June, early July, and October samples (15 mg/l or less) (Table 4).

pH

pH is a measure of the acidity of water and regulates the biological processes that may occur in a water body. Maine's HETL recommends that pH should be analyzed immediately after sampling; therefore, HETL considers the results presented in Table 4 to be estimates. pH ranged from 6.5 to 7.0 with an average of 6.8 (Table 4). All pH values were within the recommended range of 6.0 to 8.5 for Class C waters.

Secchi Disk

Secchi disk transparency is a measure of the clarity of water and is the distance that visible light penetrates through the water column. Transparency in a water column is influenced by suspended particles (e.g., algae, zooplankton, and silt) and water color, and is an indirect measure of algal growth. In the Lower Barker impoundment, the Secchi disk transparency ranged from 1.3 to 4.1 meters with an average of 2.5 meters (Table 4). The Secchi disk transparency was less than the proposed standard of 2.0 meters on June 24, August 13, and October 22. In general, the lower Secchi disk readings (less than 3.0 meters) corresponded with periods of higher river flows, suggesting that increased amounts of soil or organic matter contributed to the reduced transparency levels rather than larger concentration of algae. The deepest Secchi disk readings (3.0 meters or deeper) coincided with lower color levels (24 to 25 PCU), higher alkalinity (21 to 23 mg/l), and lower total phosphorus (0.013 to 0.016 mg/l) in mid to late August and September (Table 4).

Trophic State

Total phosphorus, chlorophyll-a, and Secchi disk transparency are often used as indicators of trophic state, or the biological productivity in a water body, particularly a lake (MDEP 2014b). An oligotrophic lake is one with low productivity; a mesotrophic lake has medium productivity, and a eutrophic lake is highly productive. Table 5 lists the criteria used to classify the trophic state of lakes in Maine (MDEP 2014b).

The Maine Trophic State Index (TSI) for a water body with color greater than 30 PCU can be calculated as (MDEP 1996):

$$TSI = 70*\log(\text{mean chlorophyll-a} + 0.7)$$

Using the average chlorophyll-a concentration for the entire sampling period (Table 4), the TSI for the Lower Barker impoundment is 40, which is categorized as mesotrophic.

TABLE 4 EPILIMNETIC CORE SAMPLE RESULTS FOR LOWER BARKER IMPOUNDMENT

SAMPLE DATE	SAMPLE TIME	TOTAL PHOSPHORUS (MG/L)	CHLOROPHYLL-A (MG/L)	TOTAL ALKALINITY (MG/L)	COLOR (PCU)	PH	SECCHI DISK (M)
6/9	13:40	0.021	0.0028	15	40	6.7	2.7
6/24	14:45	0.031	0.0024	15	42	6.7	1.4
7/7	16:05	0.021	0.0029	15	42	6.6	2.3
7/23	14:50	0.022	0.0030	20	30	7	2.5
8/13	13:50	0.023	0.0034	23	25	7	1.3
8/26	13:20	0.016	0.0029	23	25	7	3.4
9/9	13:30	0.014	0.0029	21	24	7	4.1
9/22	13:20	0.013	0.0037	22	23	6.9	3.0
10/6	12:15	0.026	0.0026	12	46	6.6	2.3
10/22	13:20	0.023	0.0034	15	38	6.5	1.9
AVERAGE		0.021	0.0030	18.1	33.5	6.8	2.5
MEDIAN		0.022	0.0029	17.5	34	6.8	2.4
MINIMUM		0.013	0.0024	12.0	23	6.5	1.3
MAXIMUM		0.031	0.0037	23.0	46	7.0	4.1

TABLE 5 CRITERIA FOR CLASSIFYING THE TROPHIC STATE OF LAKES IN MAINE

TROPHIC STATE	CHLOROPHYLL-A (MG/L)	TOTAL PHOSPHORUS (MG/L)	SECCHI DISK (M)
Oligotrophic	< 0.0015	< 0.0045	> 8
Mesotrophic	0.0015 - 0.007	0.0045 - 0.02	4 - 8
Eutrophic	> 0.007	> 0.02	< 4

The Lower Barker impoundment had characteristics of all three trophic states. Considering the entire data set, the chlorophyll-a and total phosphorus values were consistent with medium and high productivity; however, when considering only the samples collected during mid to late August and September that correspond to the summertime period of high temperature and low flow period, the total phosphorus concentration fell into the range for oligotrophic water.

2.3.2 LATE SUMMER CONDUCTIVITY, METALS, AND NUTRIENTS SAMPLE

Conductivity

Conductivity is a measure of the concentration of dissolved ions in water and is an indicator of the presence of pollutants. Conductivity was 135 µS/cm in the single sample collected in the Lower Barker impoundment (Table 6). This result reflects an influence from pollution sources (e.g., urbanization).

Dissolved Metals and Nutrients

Table 6 lists the concentrations of metals and nutrients from August 13, 2015, sample from the Lower Barker impoundment. The concentrations of iron (0.65 mg/l) and chloride (23 mg/l) were less than the established standards (Table 6). The concentration of aluminum was below the detection limit and is assumed to have been below the standard of 0.087 mg/l. Maine has no established standards for the other parameters.

TABLE 6 CONCENTRATIONS OF DISSOLVED METALS AND NUTRIENTS IN LOWER BARKER IMPOUNDMENT, AUGUST 13, 2015

PARAMETER	UNIT	VALUE
Conductivity	µS/cm	135
Chloride	mg/l	23
Nitrate	mg/l	0.09
Sulfate	mg/l	4
Calcium	mg/l	8.7
Iron	mg/l	0.65
Magnesium	mg/l	1.7
Potassium	mg/l	1.5
Silica	mg/l	4.2
Sodium	mg/l	12
Aluminum	mg/l	<0.2
DOC	mg/l	1.7

2.3.3 IMPOUNDMENT WATER TEMPERATURE AND DISSOLVED OXYGEN PROFILES

The temperature was uniform throughout the water column during the June 9 (ranged from 17.2°C to 17.3°C or 63.0°F to 63.1°F) and June 24 (ranged from 19.3°C to 19.4°C or 66.7°F to 66.9°F) profiles (Table 7). Water temperature increased in July and early August. The highest water temperatures occurred on August 26 (ranged from 23.2°C to 23.9°C or 73.8°F to 75.0°F) and September 9 (ranged from 21.9°C to 24.7°C or 71.4°F to 76.5°F). Water temperature decreased throughout the remainder of September and October. During the last profile on October 22, temperature ranged from 9.3°C to 9.5°C (48.7°F to 49.1°F) (Table 7).

The DO concentrations and percent saturation were uniform throughout the water column during each profile (Table 7 and Table 8). During the June 9 and June 24 profiles, DO ranged from 9.16 mg/l to 9.28 mg/l and from 9.36 mg/l to 9.40 mg/l, respectively. Concentrations and percent saturation of DO decreased slightly from the surface to the bottom of the impoundment in the profiles measured on July 23 (range 7.91 mg/l to 8.56 mg/l, 92.2 percent to 101.2 percent), August 26 (range 7.84 mg/l to 8.73 mg/l, 91.9 percent to 103.4 percent), and September 9 (range 7.87 mg/l to 8.64 mg/l; 89.7 percent to 103.7 percent) profiles (Table 8 and Table 9). The lowest DO concentrations coincided with the warmest water temperatures on August 26 and September 9. The highest DO levels were observed in the profiles measured on October 6 (10.58 mg/l to 10.70 mg/l) and October 22 (10.40 mg/l to 10.67 mg/l) profiles (Table 8). Throughout the monitoring period, the DO percent saturation ranged from 89.7 percent to 103.7 percent (Table 8). The DO measurements exceeded the state standard for Class C waters of 5 mg/l or 60 percent saturation throughout the June to October sampling period, demonstrating that the water of the Lower Barker impoundment is well oxygenated.

A seasonal epilimnion (i.e., lake stratification) is defined as a 1°C change in temperature over a 1-meter change in depth. An ephemeral epilimnion can form in the top 2 to 3 meters following a few calm, warm days. The greatest changes in the water column temperature occurred on August 13 and September 9 when the water temperature decreased by 2.3°C and 2.8°C, respectively, from the surface to the bottom of the impoundment (Table 7). Given the shallowness of the impoundment and that DO concentrations remained fairly consistent throughout the water column (values were above 7.87 mg/l on August 13 and September 9) (Table 8), no evidence of stratification was observed.

TABLE 7 PROFILES OF WATER TEMPERATURE (°C) IN LOWER BARKER IMPOUNDMENT, JUNE – OCTOBER, 2015

DEPTH (M)	6/9	6/24	7/7	7/23	8/13	8/26	9/9	9/22	10/6	10/22
	13:05	14:25	15:45	14:50	13:10	13:10	13:45	13:10	12:05	13:10
0	17.4	19.4	22.3	23.8	24.1	23.9	24.7	20.1	13.2	9.5
1	17.3	19.3	22.0	23.3	22.5	23.7	24.5	19.9	12.9	9.4
2	17.3	19.3	22.0	23.1	22.1	23.5	23.7	19.8	12.8	9.4
3	17.3	19.3	21.8	23.1	21.8	23.2	21.9	19.7	12.7	9.3
4	17.2	–	–	–	–	23.2	–	–	–	–
AVG (°C)	**17.3**	**19.3**	**22.0**	**23.3**	**22.6**	**23.5**	**23.7**	**19.9**	**12.9**	**9.4**
AVG (°F)	**63.1**	**66.8**	**71.6**	**74.0**	**72.7**	**74.3**	**74.7**	**67.8**	**55.2**	**48.9**

TABLE 8 PROFILES OF DO CONCENTRATION (MG/L) IN LOWER BARKER IMPOUNDMENT, JUNE – OCTOBER, 2015

DEPTH (M)	6/9	6/24	7/7	7/23	8/13	8/26	9/9	9/22	10/6	10/22
	13:05	14:25	15:45	14:50	13:10	13:10	13:45	13:10	12:05	13:10
0	9.28	9.36	8.74	8.56	8.60	8.62	8.63	8.67	10.70	10.67
1	9.23	9.39	8.73	8.33	8.75	8.73	8.64	8.77	10.63	10.56
2	9.21	9.40	8.68	8.15	8.91	8.69	8.47	8.68	10.62	10.49
3	9.19	9.37	8.69	7.91	8.62	8.06	7.87	8.60	10.58	10.40
4	9.16	–	–	–	–	7.84	–	–	–	–
AVG	**9.2**	**9.4**	**8.7**	**8.2**	**8.7**	**8.4**	**8.4**	**8.7**	**10.6**	**10.5**

TABLE 9 PROFILES OF DO PERCENT SATURATION (%) IN LOWER BARKER IMPOUNDMENT, JUNE – OCTOBER, 2015

DEPTH (M)	6/9	6/24	7/7	7/23	8/13	8/26	9/9	9/22	10/6	10/22
	13:05	14:25	15:45	14:50	13:10	13:10	13:45	13:10	12:05	13:10
0	96.7	101.6	100.3	101.2	102.4	102.1	103.7	95.8	101.5	93.3
1	96.4	101.8	99.8	97.7	102.0	103.4	103.6	96.2	100.8	92.2
2	96.0	101.8	99.3	95.0	102.1	102.4	99.7	95.1	100.3	91.7
3	95.6	101.4	99.0	92.2	98.2	94.5	89.7	94.2	99.9	90.4
4	95.1	–	–	–	–	91.9	–	–	–	–
AVG	**96.0**	**101.7**	**99.6**	**96.5**	**101.2**	**98.9**	**99.2**	**95.3**	**100.6**	**91.9**

2.3.4 RIVERINE SAMPLING

2.3.4.1 WATER TEMPERATURE

The water temperature in the bypassed reach ranged from 20.0°C (68.0°F) to 26.4°C (79.6°F) with an average of 23.1°C (73.7°F) throughout the sampling period (July 7 – September 9) (Table 10 and Figure 3). The minimum temperature in the bypassed reach was recorded on June 9 at 6:00 am, and the highest temperature was observed on August 19 at 3:00 pm. The water temperature in the tailrace ranged from 17.5°C (63.5°F) on July 7 at 10 pm to 26.4°C (79.6°F) on August 19 at 5:00 pm with an average of 22.5°C (72.6°F). The minimum values observed on July 7, July 9 (18.2°C), and July 16 (18.2°C) (Figure 4) correspond to operational changes made during nighttime eel surveys being conducted downstream from the dam (i.e., a slight increase in generation to reduce spill in the bypassed reach for a few hours to allow surveyors to survey the dam area for eels; see Section 4.0). From the beginning of sampling through July 23, the average water temperature in the bypassed reach (22.9°C) was approximately 2°C warmer than water temperature in the tailrace (20.8°C).

TABLE 10 WATER TEMPERATURE DOWNSTREAM OF THE LOWER BARKER DAM, JULY 7 – SEPTEMBER 9, 2015

VARIABLE	BYPASSED REACH		TAILRACE	
Average Water Temperature	23.1 C	73.7 F	22.5 C	72.6 F
Median Water Temperature	23.1 C	73.6 F	22.6 C	72.6 F
Minimum Water Temperature	20.0 C	68.0 F	17.5 C	63.5 F
Maximum Water Temperature	26.4 C	79.6 F	26.4 C	79.6 F

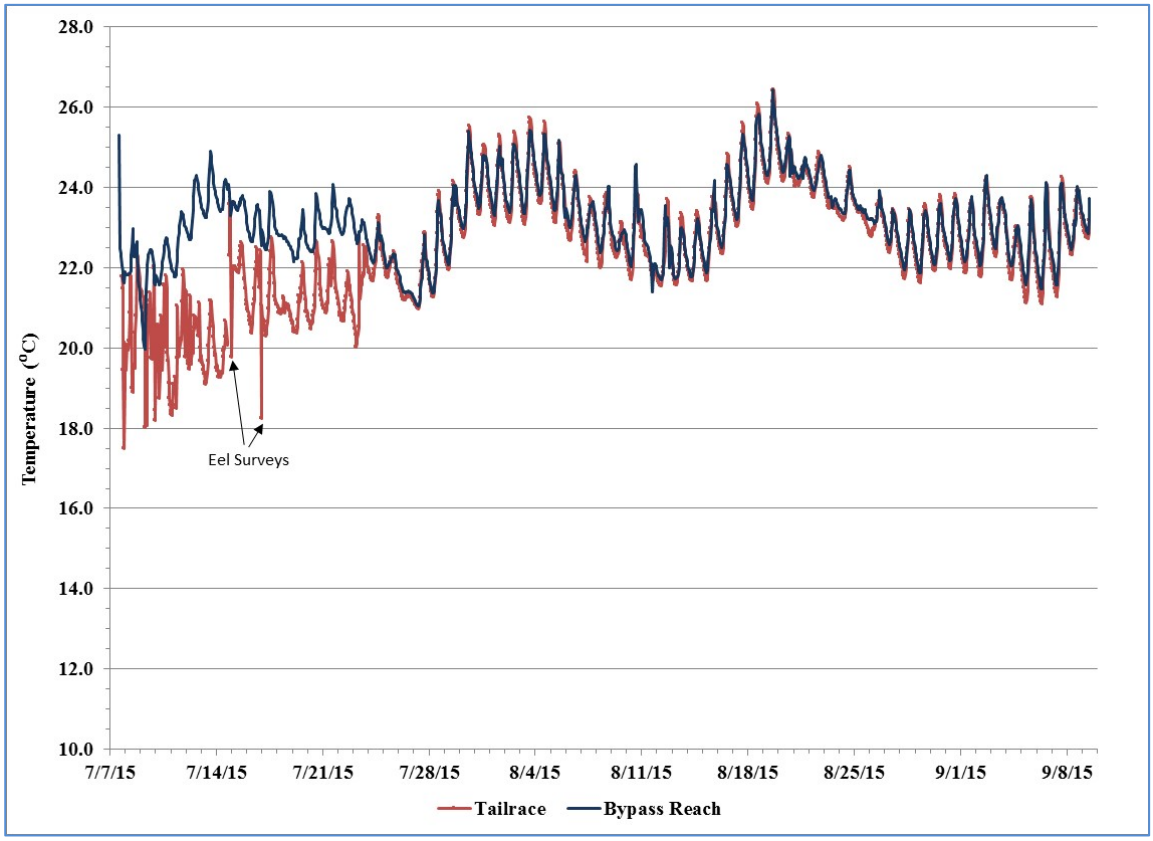


FIGURE 3 HOURLY WATER TEMPERATURE TIME SERIES IN THE TAILRACE AND BYPASSED REACH, JULY 7 – SEPTEMBER 9, 2015

2.3.4.2 DISSOLVED OXYGEN

Hourly DO concentrations in the bypassed reach ranged from 6.36 to 9.37 mg/l with an average of 8.50 mg/l over the monitoring period (Table 11 and Figure 4). Hourly DO percent saturation ranged from 75.3 to 107.7 percent with an average of 99.9 percent (Table 11 and Figure 5). In the tailrace, DO ranged from 7.15 to 9.69 mg/l with an average of 8.32 mg/l, and the percent saturation ranged from 80.9 to 108.4 percent with an average of 96.6 percent (Table 11, Figure 4, and Figure 5). The concentration of DO decreased rapidly to less than 7 mg/l in the bypassed reach briefly on the afternoon of August 10; this preceded a less pronounced decrease in DO concentrations in the tailrace (Figure 4). The lowest DO concentration in the tailrace (7.15 mg/l) was observed on August 25 and coincided with a period of elevated river flows.

Some erratic DO measurements (values between 4.5 to 7.0 mg/l) occurred in the bypassed reach data set from August 12 at 8:00 pm to August 13 at 4:00 pm. Possible explanations for these readings include bio-fouling, sedimentation on the logger, or equipment malfunction. Episodic erratic measurements in DO data are consistent with sedimentation or bio-fouling of the loggers

(personal communications, Onset Hobo Data Logger technical support, August 6, 2015, and February 5, 2016). No concurrent erratic patterns were observed in the temperature data for the bypassed reach or in the DO and temperature data for the tailrace. Furthermore, DO values in the impoundment on the afternoon of August 13 ranged from 8.60 to 8.91 mg/l; DO concentrations were within a similar range in the tailrace. Based on professional experience and comparisons between DO and temperature patterns in the impoundment and tailrace, the erratic measurements of DO in the bypassed reach are considered to be the result of equipment error or fouling and were removed from the final data set.

TABLE 11 CONCENTRATION AND PERCENT SATURATION OF DISSOLVED OXYGEN DOWNSTREAM OF THE LOWER BARKER DAM, JUNE 7 – SEPTEMBER 9, 2015

	BYPASSED REACH		TAILRACE	
VARIABLE	DO (MG/L)	DO (%)	DO (MG/L)	DO (%)
Average	8.50	99.9	8.32	96.6
Median	8.52	100.1	8.32	97.0
Minimum	6.36	75.3	7.15	80.9
Maximum	9.37	107.7	9.69	108.4

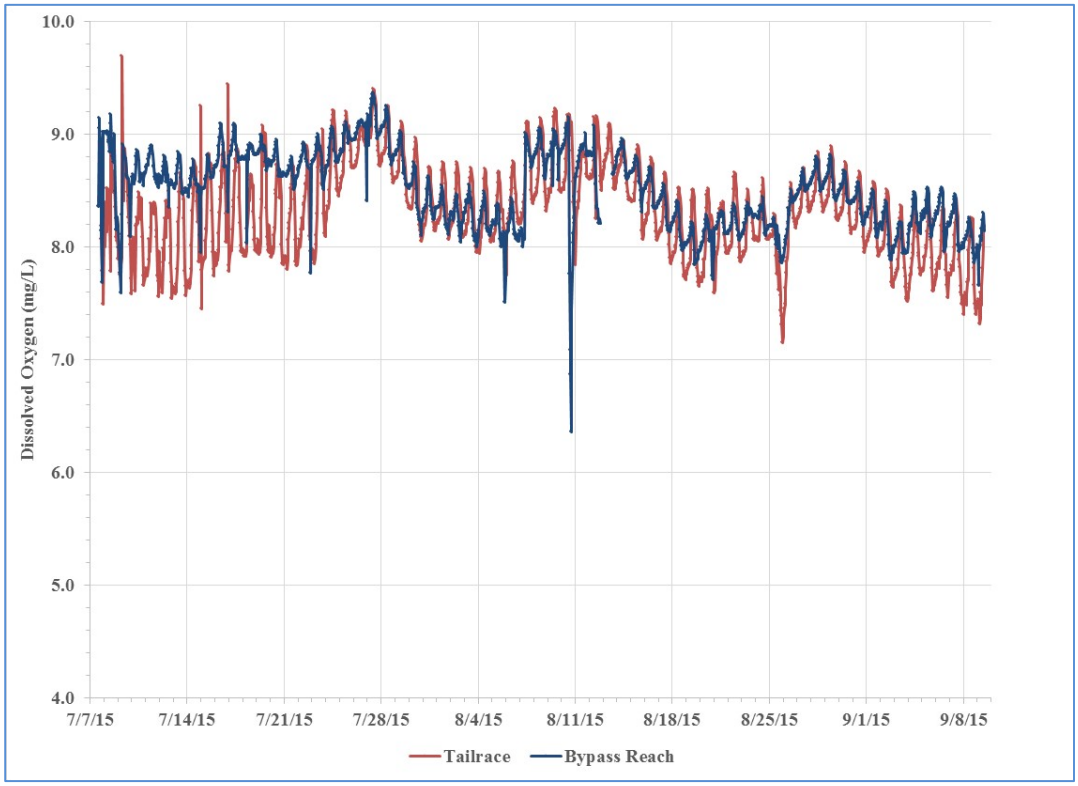


FIGURE 4 HOURLY DO CONCENTRATION (MG/L) TIME SERIES IN THE TAILRACE AND BYPASSED REACH, JULY 7 TO SEPTEMBER 9, 2015

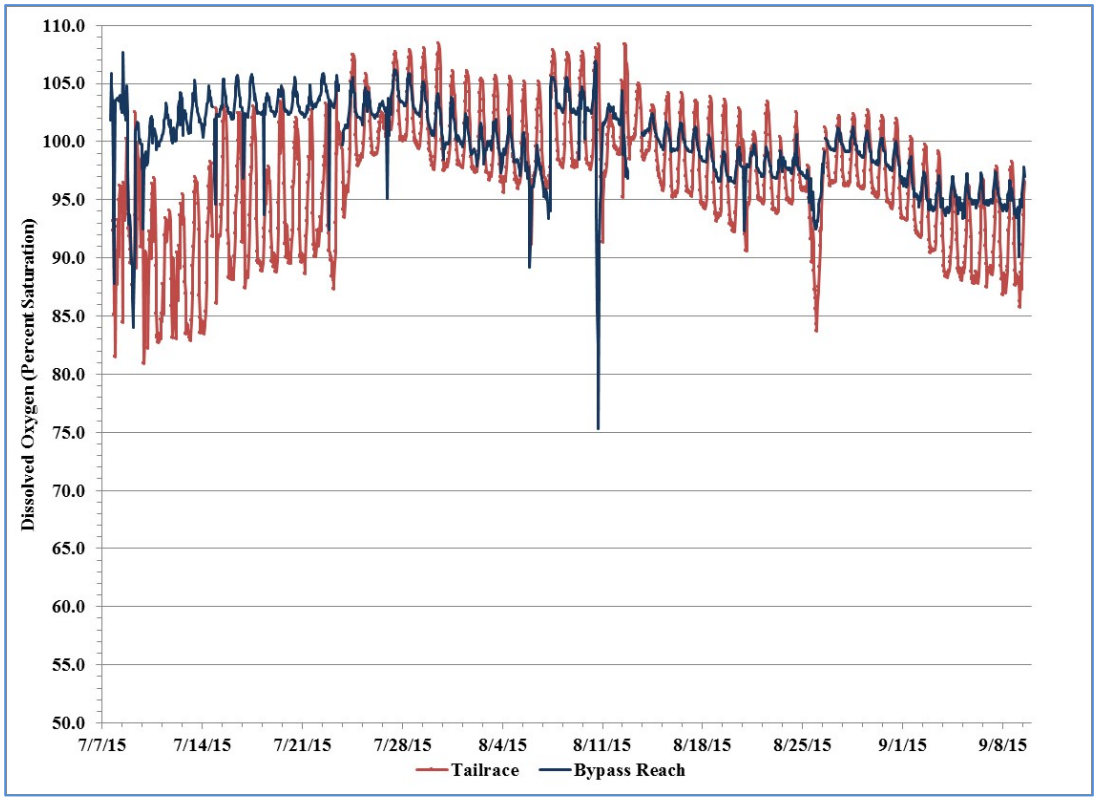


FIGURE 5 HOURLY DO PERCENT SATURATION TIME SERIES IN THE TAILRACE AND BYPASSED REACH, JULY 7 – SEPTEMBER 9, 2015

2.3.5 COMPARISON TO PREVIOUS SAMPLING

As part of a study of water quality of the Lower Androscoggin River Basin, MDEP collected data at the confluence of the Little Androscoggin River and Androscoggin River (approximately 0.75 river mile downstream of the Lower Barker Project) during the summer of 2010 (MDEP 2011). The concentrations of chlorophyll-a and total phosphorus were within the range observed in the Lower Barker impoundment in 2015 (Table 12). The MDEP Biomonitoring Unit sampled water quality in July and August 2014 and July 2015 approximately 8.3 river miles upstream of the Lower Barker dam (Table 13). Those results were consistent with the temperature, DO, pH, total phosphorus, and alkalinity values measured in the Lower Barker impoundment in 2015. The conductivity values (83 to 98.5 µS/cm, Table 13) were lower than observed in the Lower Barker impoundment. In addition, the single conductivity measurement in the Lower Barker impoundment in 2015 by KEI (Maine) was higher than the mean of 46 µS/cm (range 10 to 807 µS/cm) observed in more than 1,000 lakes in Maine (MDEP 2014a) and higher than measured at seven sites in the lower Androscoggin River (60 to 120 µS/cm, mean 60 to 81 µS/cm) in spring-early fall 2014 (MDEP 2015).

TABLE 12 MDEP'S WATER QUALITY MONITORING RESULTS FROM JULY AND AUGUST 2010 DOWNSTREAM OF THE LOWER BARKER PROJECT

DATE	CHLOROPHYLL-A (MG/L)	TOTAL PHOSPHORUS (MG/L)
07/13/2010	0.0025	0.021
07/15/2010	0.0036	0.019
07/16/2010	0.0028	0.019
08/02/2010	0.0025	0.019
08/03/2010	0.0028	0.022
08/04/2010	0.0028	0.018

Source: MDEP 2011

TABLE 13 MDEP'S WATER QUALITY MONITORING UPSTREAM OF THE LOWER BARKER PROJECT

DATE	TEMPERATURE (°C)	DO (MG/L)	PH	TOTAL PHOSPHORUS (MG/L)	TOTAL ALKALINITY (MG/L)	CONDUCTIVITY (µS/CM)
7/14/2014	25.0	7.9	7.14	–	–	83
7/22/2014	22.2	7.4	6.06	0.020	15	97
8/12/2014	22.3	8.4	6.9	0.017	–	84
7/15/2015	23.6	7.8	7.13	0.019	17	98.5

Source: MDEP Biomonitoring Unit; http://www.maine.gov/dep/water/monitoring/biomonitoring/data.htm

2.4 SUMMARY

KEI (Maine)'s sampling in 2015 demonstrated that the Lower Barker Project impoundment meets the established state standard for DO in Class C waters of 5 mg/l or 60 percent saturation. The impoundment did not thermally stratify and there was no evidence of a seasonal epilimnion. According to the state standard, the 30-day average DO concentration criterion for Class C waters is 6.5 mg/l to ensure that water quality is sufficient for spawning and to protect the growth of indigenous fish. The average DO concentrations in the bypassed reach for July, August, and September were 8.74, 8.40, 8.19 mg/l, respectively. In the one identified potential salmonid spawning area in the bypassed reach, the DO concentration exceeded the established standard throughout the sampling period. Given that measurements were taken during the period of low flow and high temperature, DO is expected to be suitable for salmonids throughout the cooler fall and winter months. The low Secchi disk transparency results (less than 2.0 meters) in early to mid-summer and fall may have resulted from increased runoff and sediment loadings rather than algal blooms. Furthermore, concentrations of chlorophyll-a and total phosphorus in all samples were less than the proposed state standards.

In summary, the sampling completed by KEI (Maine) in 2015 demonstrates that the Little Androscoggin River at the Lower Barker Project meets the designated use of "recreation in and on the water" and meets applicable water quality standards for Class C waters. To assess whether the operation of the Lower Barker Project meets this designation for "habitat for fish and other aquatic life," KEI (Maine) studied benthic macroinvertebrate (see Section 3.0) and completed an instream flow habitat study in the bypassed reach below the dam (see Section 5.0).

3.0 BENTHIC MACROINVERTEBRATE STUDY

3.1 INTRODUCTION

MDEP requested that KEI (Maine) perform an aquatic life criteria study (i.e., benthic macroinvertebrate sampling) to assess whether the Little Androscoggin River attains Class C water quality standards and the designated use of "habitat for fish and other aquatic life" at the Lower Barker Project. According to 38 MRSA §464 (9) and (10), existing hydropower impoundments classified as Great Ponds or as river and streams, and downstream reaches of river and streams that are influenced by hydropower projects must only meet the requirements of MRSA §465 (4)(C) of Class C waters (i.e., "maintain structure and function of the resident biological community"). The term "resident biological community" is defined as "aquatic life expected to exist in a habitat which is free from the influence of the discharge of any pollutant."

The characteristics of the benthic macroinvertebrate community are indicators of overall stream health; changes in species metrics often occur because of deterioration or improvements in water quality. In general, an unpolluted waterbody has a higher percentage of taxa from the orders Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies); whereas, pollution-tolerant taxa (e.g., chironomids – midge flies) dominate the community in poor-quality waters.

The objectives of the study were to:

- evaluate whether the Little Androscoggin River attains Class C water quality standards at the Lower Barker Project based on the composition of the benthic macroinvertebrate community; and
- determine whether the current operating regime and minimum flow requirements are maintaining the structure and function of the resident benthic macroinvertebrate community.

3.2 METHODS

The field and laboratory procedures for this study followed *Methods for Biological Sampling and Analysis of Maine's Inland Waters* (Davies and Tsomides 2002). Standard rock bags were installed at two sites downstream of the Lower Barker dam (Figure 6). Site 1 was approximately 850 feet below the Lower Barker Dam in the bypassed reach between the dam and the powerhouse (Figure 6; Photo 4 - Photo 6). Site 2 was approximately 1,750 feet downstream of the dam and approximately 400 feet downstream of the powerhouse (Figure 6; Photo 7 to Photo 9).

FIGURE 6 BENTHIC MACROINVERTEBRATE SAMPLING SITES DOWNSTREAM OF THE LOWER BARKER DAM, JULY – AUGUST 2015

PHOTO 4 BENTHIC MACROINVERTEBRATE SAMPLE SITE 1 VIEW SOUTHWEST (UPSTREAM), JULY 22, 2015

PHOTO 5 BENTHIC MACROINVERTEBRATE SAMPLE SITE 1 VIEW NORTHEAST (DOWNSTREAM), JULY 22, 2015

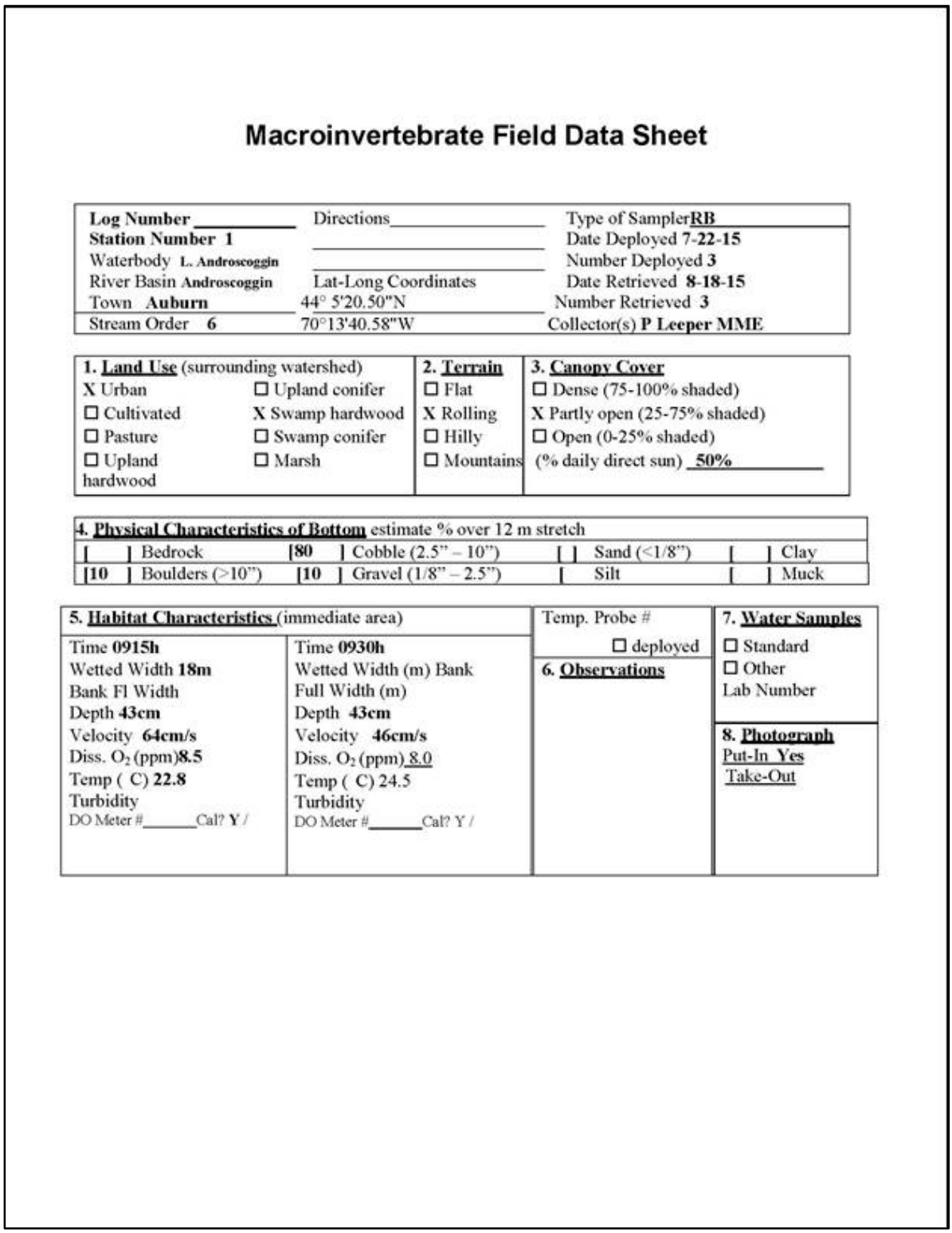
PHOTO 6 BENTHIC MACROINVERTEBRATE SAMPLE 1 VIEW WEST, JULY 22, 2015

PHOTO 7 BENTHIC MACROINVERTEBRATE SAMPLE SITE 2 VIEW SOUTHWEST (UPSTREAM), JULY 22, 2015

PHOTO 8 BENTHIC MACROINVERTEBRATE SAMPLE SITE 2 VIEW NORTHWEST, JULY 22, 2015

PHOTO 9 BENTHIC MACROINVERTEBRATE SAMPLE SITE 2 VIEW NORTHEAST (DOWNSTREAM), JULY 22, 2015

The rock bag samplers hold approximately 16 pounds of clean, washed, bank-run cobble that is graded to a uniform diameter range of 1.5 to 3 inches. In accordance with MDEP protocols, three samplers were placed at each sample site on July 22, 2015, and were left in the river for approximately 28 days (± 4 days) to allow for invertebrate colonization. The samplers were retrieved on August 18, 2015, using an aquatic D-net. The net was placed directly downstream of a sampler; the sampler was then picked up and placed in the net. The contents of each sampler and the net were washed through a sieve bucket and preserved in labeled jars. The samples were transported to Moody Mountain Environmental laboratory. Habitat measurements including substrate type, depth, and temperature were collected on the day of sampler retrieval (Figure 7 and Figure 8). The three samplers (replicates) from each site were sorted, identified, and enumerated.



Macroinvertebrate Field Data Sheet

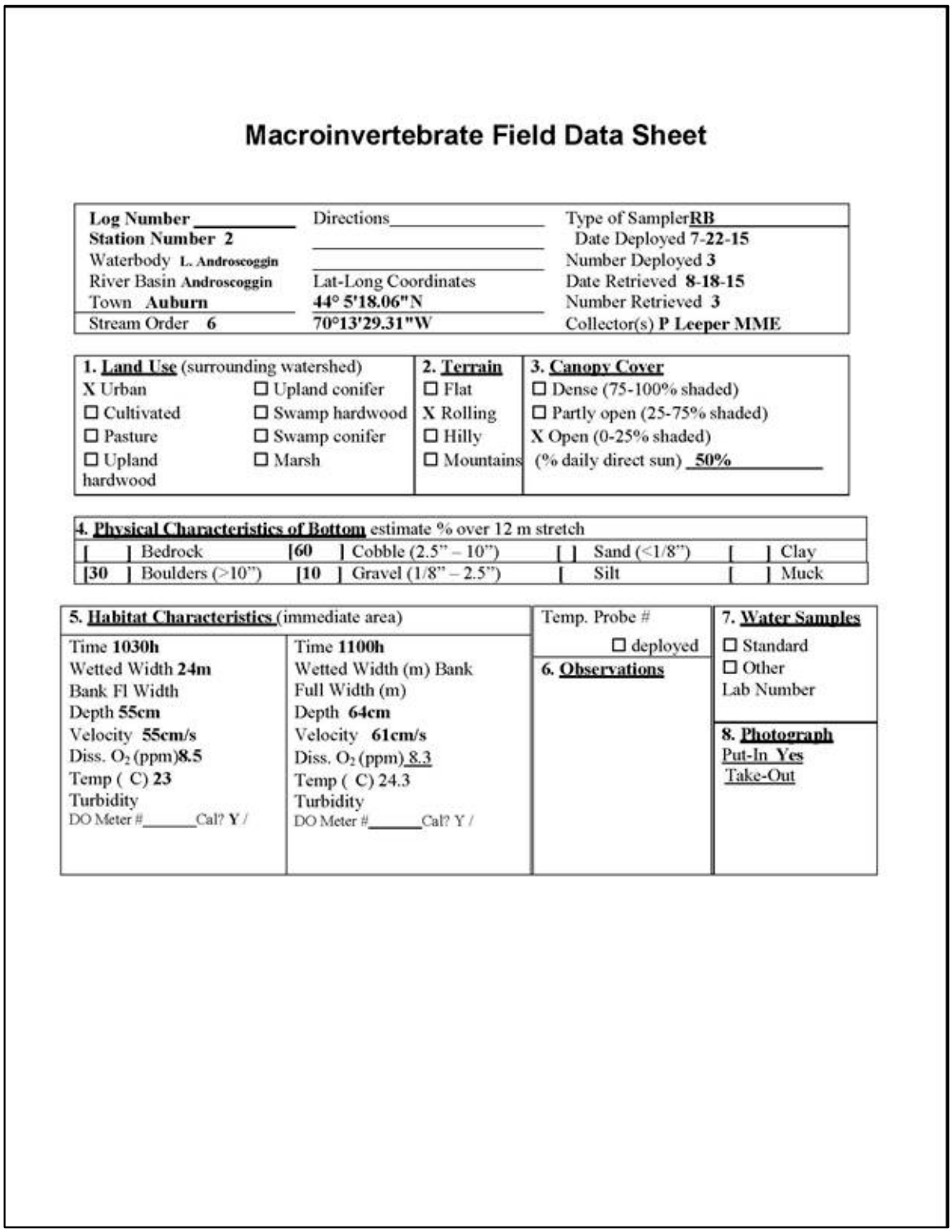
Log Number _____	Directions_____	Type of Sampler**RB**
Station Number 1	_____	Date Deployed **7-22-15**
Waterbody **L. Androscoggin**	_____	Number Deployed **3**
River Basin **Androscoggin**	Lat-Long Coordinates	Date Retrieved **8-18-15**
Town **Auburn**	44° 5'20.50"N	Number Retrieved **3**
Stream Order **6**	70°13'40.58"W	Collector(s) **P Leeper MME**

1. **Land Use** (surrounding watershed)		2. **Terrain**	3. **Canopy Cover**
X Urban	☐ Upland conifer	☐ Flat	☐ Dense (75-100% shaded)
☐ Cultivated	X Swamp hardwood	X Rolling	X Partly open (25-75% shaded)
☐ Pasture	☐ Swamp conifer	☐ Hilly	☐ Open (0-25% shaded)
☐ Upland hardwood	☐ Marsh	☐ Mountains	(% daily direct sun) **50%**

4. **Physical Characteristics of Bottom** estimate % over 12 m stretch			
[ ] Bedrock	[**80**] Cobble (2.5" – 10")	[ ] Sand (<1/8")	[ ] Clay
[**10**] Boulders (>10")	[**10**] Gravel (1/8" – 2.5")	[ ] Silt	[ ] Muck

5. **Habitat Characteristics** (immediate area)		Temp. Probe # ☐ deployed	7. **Water Samples**
Time **0915h**	Time **0930h**	6. **Observations**	☐ Standard
Wetted Width **18m**	Wetted Width (m) Bank		☐ Other
Bank Fl Width	Full Width (m)		Lab Number
Depth **43cm**	Depth **43cm**		8. **Photograph**
Velocity **64cm/s**	Velocity **46cm/s**		Put-In **Yes**
Diss. O_2 (ppm)**8.5**	Diss. O_2 (ppm) 8.0		Take-Out
Temp (C) **22.8**	Temp (C) 24.5		
Turbidity	Turbidity		
DO Meter #_____Cal? Y /	DO Meter #_____Cal? Y /		

FIGURE 7 SITE 1 HABITAT MEASUREMENTS IN THE LITTLE ANDROSCOGGIN RIVER DOWNSTREAM OF LOWER BARKER DAM



Macroinvertebrate Field Data Sheet

Log Number _____	Directions_____	Type of Sampler**RB**
Station Number 2	_____	Date Deployed **7-22-15**
Waterbody **L. Androscoggin**	_____	Number Deployed **3**
River Basin **Androscoggin**	Lat-Long Coordinates	Date Retrieved **8-18-15**
Town **Auburn**	**44° 5'18.06"N**	Number Retrieved **3**
Stream Order **6**	**70°13'29.31"W**	Collector(s) **P Leeper MME**

1. Land Use (surrounding watershed)		**2. Terrain**	**3. Canopy Cover**
X Urban	☐ Upland conifer	☐ Flat	☐ Dense (75-100% shaded)
☐ Cultivated	☐ Swamp hardwood	X Rolling	☐ Partly open (25-75% shaded)
☐ Pasture	☐ Swamp conifer	☐ Hilly	X Open (0-25% shaded)
☐ Upland hardwood	☐ Marsh	☐ Mountains	(% daily direct sun) **50%**

4. Physical Characteristics of Bottom estimate % over 12 m stretch

[ ]	Bedrock	[60]	Cobble (2.5" – 10")	[ ]	Sand (<1/8")	[ ]	Clay
[30]	Boulders (>10")	[10]	Gravel (1/8" – 2.5")	[ ]	Silt	[ ]	Muck

5. Habitat Characteristics (immediate area)		Temp. Probe # ☐ deployed	**7. Water Samples** ☐ Standard ☐ Other Lab Number
Time **1030h**	Time **1100h**	**6. Observations**	**8. Photograph** Put-In **Yes** Take-Out
Wetted Width **24m**	Wetted Width (m) Bank		
Bank Fl Width	Full Width (m)		
Depth **55cm**	Depth **64cm**		
Velocity **55cm/s**	Velocity **61cm/s**		
Diss. O_2 (ppm)**8.5**	Diss. O_2 (ppm) 8.3		
Temp (C) **23**	Temp (C) 24.3		
Turbidity	Turbidity		
DO Meter #_____Cal? **Y** /	DO Meter #_____Cal? Y /		

FIGURE 8 SITE 2 HABITAT MEASUREMENTS IN THE LITTLE ANDROSCOGGIN RIVER DOWNSTREAM OF THE LOWER BARKER DAM

3.3 RESULTS

The benthic macroinvertebrate communities sampled downstream of the Lower Barker dam were moderately abundant and very rich in taxa (Table 14 and Table 15). The community at Site 1 was populated with 36 different taxa with a mean total abundance of 252 (Table 16). The Site 2 community was more numerous (total abundance of 334) but was slightly less rich, with 34 taxa (Table 16). Filter-feeding caddisflies constituted more than 34 percent of the total abundance at Site 1 and more than 57 percent at Site 2. The communities were relatively diverse and had Shannon-Weiner Diversity values of 2.63 (Site 1) and 2.65 (Site 2). Sensitive mayflies and stoneflies represented a considerable segment of the community; 13 taxa at Site 1 and 12 taxa at Site 2 represented 38 percent and 30 percent of the communities, respectively (Table 16). Hilsenhoff Biotic Index values of 3.41 at Site 1 and 3.51 at Site 2 indicated very good to excellent water quality (Hilsenhoff 1987).

Table 17 lists the dominant organisms (i.e., taxa representing more than 5 percent of total abundance) in each community arranged from the most sensitive organisms to the organisms that are most tolerant of poor water quality. The community at Site 1 had six sensitive to intermediate organisms that constituted 59 percent of the total abundance and one tolerant organism that represented 16 percent of the total abundance (Table 17). This community was dominated by sensitive and intermediate organisms. At Site 2, eight organisms constituted 78 percent of the community; sensitive organisms dominated the community, and no pollution-tolerant genera were dominant.

The structure and function of the benthic macroinvertebrate community downstream of the Lower Barker dam provides some evidence for organic enrichment and filter-feeder dominance, which is a common phenomenon below lake outlets and impoundments (Hynes 1970; Spence and Hynes 1971; Parker and Voshell 1983). However, the presence of sensitive stoneflies and mayflies indicates no loss of genera and no excessive dominance by any group.

TABLE 14 BENTHIC MACROINVERTEBRATES, LITTLE ANDROSCOGGIN RIVER SAMPLING SITE 1, JULY – AUGUST, 2015

TAXON NAME		REPLICATE 1	REPLICATE 2	REPLICATE 3	MEAN	%
Planariidae		28	26	70	41.3	16.4%
Acroneuria		2	7	2	3.7	1.5%
Perlesta		0	2	0	0.7	0.3%
Agnetina		2	1	1	1.3	0.5%
Procloeon		13	50	6	23.0	9.1%
Plauditus		44	45	3	30.7	12.2%
Heptageniidae		15	12	1	9.3	3.7%
Stenacron		0	8	0	2.7	1.1%
Maccaffertium		7	16	13	12.0	4.8%
Stenonema		2	12	2	5.3	2.1%
Isonychia		0	0	2	0.7	0.3%
Ephemerella		3	5	2	3.3	1.3%
Eurylophella		4	0	0	1.3	0.5%
Caenis		3	0	0	1.0	0.4%
Chimarra		103	33	11	49.0	19.5%
Neureclipsis		2	0	1	1.0	0.4%
Cheumatopsyche		22	16	15	17.7	7.0%
Hydropsyche		21	15	6	14.0	5.6%
Macrostemum		6	3	6	5.0	2.0%
Rhyacophila		1	1	0	0.7	0.3%
Micrasema		1	1	0	0.7	0.3%
Lepidostoma		1	0	1	0.7	0.3%
Oecetis		1	1	1	1.0	0.4%
Chironomidae		0	1	0	0.3	0.1%
Eukiefferiella		0	1	0	0.3	0.1%
Rheotanytarsus		3	2	2	2.3	0.9%
Endochironomus		0	1	0	0.3	0.1%
Microtendipes		1	1	0	0.7	0.3%
Polypedilum		1	2	0	1.0	0.4%
Stenochironomus		0	1	0	0.3	0.1%
Simulium		21	23	0	14.7	5.8%
Psephenus		3	3	3	3.0	1.2%
Elmidae	ADULTS	2	0	0	0.7	0.3%
Microcylloepus	ADULTS	0	0	2	0.7	0.3%
Promoresia		0	0	2	0.7	0.3%
Orconectes limosus		0	1	1	0.7	0.3%
				RICHNESS	36	
				TOTAL ABUNDANCE	251. 7	

TABLE 15 BENTHIC MACROINVERTEBRATES, LITTLE ANDROSCOGGIN RIVER SAMPLING SITE 2, JULY – AUGUST, 2015

TAXON NAME		REPLICATE 1	REPLICATE 2	REPLICATE 3	MEAN	%
Planariidae		0	2	3	1.7	0.5%
Perlidae		0	1	0	0.3	0.1%
Acroneuria		1	2	1	1.3	0.4%
Agnetina		0	3	3	2.0	0.6%
Baetidae		6	4	0	3.3	1.0%
Plauditus		22	4	40	22.0	6.6%
Heptageniidae		17	10	51	26.0	7.8%
Maccaffertium		7	12	34	17.7	5.3%
Stenonema		5	18	30	17.7	5.3%
Isonychia		7	5	12	8.0	2.4%
Ephemerella		1	0	0	0.3	0.1%
Serratella		0	1	1	0.7	0.2%
Caenis		0	0	1	0.3	0.1%
Chimarra		44	19	39	34.0	10.2%
Neureclipsis		11	12	17	13.3	4.0%
Polycentropus		1	0	0	0.3	0.1%
Cheumatopsyche		41	22	41	34.7	10.4%
Hydropsyche		46	29	111	62.0	18.6%
Macrostemum		35	25	81	47.0	14.1%
Rhyacophila		0	0	1	0.3	0.1%
Lepidostoma		0	0	3	1.0	0.3%
Ceraclea		0	0	2	0.7	0.2%
Oecetis		1	2	0	1.0	0.3%
Corydalus		0	0	1	0.3	0.1%
Rheotanytarsus		9	2	5	5.3	1.6%
Microtendipes		2	0	0	0.7	0.2%
Polypedilum		8	2	5	5.0	1.5%
Simulium		13	1	20	11.3	3.4%
Psephenus		2	2	2	2.0	0.6%
Microcylloepus		0	0	1	0.3	0.1%
Promoresia		5	9	4	6.0	1.8%
Stenelmis	ADULTS	7	3	9	6.3	1.9%
Stenelmis		0	0	1	0.3	0.1%
Hydrobiidae		0	0	2	0.7	0.2%
				RICHNESS	34	
				TOTAL ABUNDANCE	334.0	

TABLE 16 INDICES OF COMMUNITY STRUCTURE FOR THE AQUATIC INVERTEBRATE COMMUNITY DOWNSTREAM OF THE LOWER BARKER DAM, JULY – AUGUST 2015

PARAMETER		SITE 1	SITE 2
Total Abundance		251.7	334.0
Taxa Richness		36	34
Shannon-Weiner Diversity		2.63	2.65
Hilsenhoff Biotic Index (HBI)		3.41	3.51
Water Quality Indication from HBI		Excellent	Very Good
Mayfly, Stonefly, Caddisfly (*Ephemeroptera*, *Plecoptera*, and *Trichoptera* [EPT]) Richness		22	22
Mayfly, Stonefly (*Ephemeroptera* and *Plecoptera* [EP])	Richness	13	12
	% Abundance	37.7	29.8
Midge	Richness	7	3
	% Abundance	2.1	3.3

TABLE 17 DOMINANT AQUATIC INVERTEBRATE ORGANISMS DOWNSTREAM OF THE LOWER BARKER DAM, JULY – AUGUST 2015

	SITE 1		SITE 2	
SENSITIVITY TO POOR WATER QUALITY	DOMINANT ORGANISM	% OF COMMUNITY	DOMINANT ORGANISM	% OF COMMUNITY
Sensitive	Chimarra	19	Chimarra	10
	Hydropsyche	6	Hydropsyche	19
	_	_	Macrostemum	14
	_	_	Maccaffertium	5
	_	_	Stenonema	5
Intermediate	Plauditus	12	Plauditus	7
	Procloeon	9	_	_
	Cheumatopsyche	7	Cheumatopsyche	10
	Simulium	6	_	_
	_	_	Heptageniidae	8
Tolerant	Planariidae	16	_	_

Enrichment and caddisfly dominance downstream of lake outlets and dam outlets is a common phenomenon that has long been reported in the literature. Illies (1956 in Spence and Hynes 1971) reported an increase in the number of filter-feeding Trichoptera below a lake when compared to upstream communities and attributed it to an increase in food availability. Filter-feeding organisms, such as *Cheumatopsyche and Neureclipsis,* are often the dominant organisms in streams and rivers (Hynes 1970) and are frequently very abundant at lake outlets (Carlsson et al. 1977; Valett and Stanford 1987). The density or biomass of these filter-feeders typically declines farther downstream (Osgood 1979). This blossoming and decline of the aquatic community may be a response to a gradient in the quantity or quality of the food resources. Filter-feeders near the lake outlet process the high-quality lake seston (i.e., particulate matter in the water), which typically is made up of algal cells, and may transform it to lower-quality detritus (Benke and Wallace 1980; Valett and Stanford 1987).

The enrichment and dominance of caddisfly also has been long observed at impoundment outlets. Spence and Hynes (1971) reported increased numbers of Hydropsychidae (*Cheumatopsyche* is a genus in the family Hydropsychidae) and other organisms downstream of an impoundment and stated that the downstream differences were comparable to mild organic enrichment. Parker and Voshell (1983) reported production of the filter-feeding Trichoptera to be greater closest to the dam than at sites farther downstream and sites on free-flowing rivers. They concluded that not only the amount of high-quality food, but also the specific size of the seston, contributed to the ability of the caddisflies to occupy this niche.

3.4 SUMMARY

The benthic macroinvertebrate communities sampled downstream of the Lower Barker dam were abundant and rich in taxa. Filter-feeders represented a sizable proportion of the communities. The dominance of filter-feeders is a natural response to the food resource exiting the upstream impoundment. The community structure and function of the benthic macroinvertebrate community downstream of the Lower Barker dam, specifically the presence of stoneflies and mayflies, indicates that there has been little, if any, change in the resident biological community. The macroinvertebrate community downstream of Lower Barker dam on the Little Androscoggin River attains Class C aquatic life standards and maintains the structure and function of the resident benthic macroinvertebrate community. In fact, the benthic macroinvertebrate community in the bypassed reach and the Little Androscoggin River downstream of the

powerhouse is representative of Class A aquatic life standards, which is the second highest water class in the state of Maine; this classification was supported by MDEP's independent review of the data (Appendix C).

4.0 JUVENILE AMERICAN EEL STUDY

4.1 INTRODUCTION

The USFWS, MDMR, and NMFS requested that KEI (Maine) study upstream passage of American eels at the Lower Barker Project. Prior to reaching the Lower Barker Project, juvenile eels entering freshwater must pass the Brunswick Hydroelectric Project (FERC No. 2284), Pejepscot Hydroelectric Project (FERC No. 4784), and the Worumbo Hydroelectric Project (FERC No. 3428). An upstream eel ladder is installed at the Worumbo Project, which is approximately 14 river miles downstream of the Lower Barker Project. There are no other dedicated upstream eel passage systems on the Androscoggin River or Little Androscoggin River. No site specific information is available about historical eel abundance, size distribution, or behavior at the Lower Barker Project.

The goal of this study was to assess the need and potential location(s) for a dedicated upstream passage facility for American eels at the Lower Barker Project. The objectives of the study were to:

- conduct systematic nighttime surveys to identify eel presence, abundance, distribution, and behavior at the Lower Barker Project;
- identify areas where eels congregate or attempt to ascend wetted structures; and
- identify potential locations for an upstream eel passage system.

4.2 METHODS

Observations at other hydroelectric projects in Maine suggest that juvenile eels typically move upstream during dusk and evening hours from early June to late August. Eleven surveys were completed between June 9 and August 5. In accordance with the study plan, KEI (Maine) elected to stop surveying in early August because of the consistently low numbers of eels observed. Researchers used binoculars and spotlights to search for juvenile eels along the downstream face of the dam and spillway, the waste gate section, and bedrock outcrops immediately downstream of the dam (Photo 10). Each survey lasted 1 hour to 1.5 hours and took place after sunset between approximately 20:30 and 22:15. Researchers noted the approximate number and size

class of eels, their location, behavior patterns, weather conditions, and whether eels congregated in specific areas.

PHOTO 10 PRIMARY SURVEY AREAS ON RIVER RIGHT (LEFT PHOTO) AND RIVER LEFT (RIGHT PHOTO) DOWNSTREAM OF THE LOWER BARKER DAM

4.3 RESULTS

River flow during the study period as measured at the South Paris gage (U.S. Geological Survey [USGS] Gage No. 01057000) and prorated to the Lower Barker dam ranged from approximately 31 cfs to 2,899 cfs. Because of low flow conditions in the summer of 2015, KEI (Maine) did not generate power throughout most of the study period, which resulted in the discharge of water over the dam. KEI (Maine) turned on the turbine unit prior to the start of the most of the surveys to reduce spill so that researchers could safely access and look for eels; some spill occurred during the June 18 and June 25 survey, but conditions were adequate for making observations from the shoreline.

Researchers observed 44 juvenile eels during the entire 2015 study (Table 18). The largest number of eels (n=24, or 55 percent of total) was observed on July 14. Ten eels (23 percent) were observed on June 16 and five eels (11 percent) were observed on July 7 (Table 18). Fewer eels were observed during the remaining surveys. Nearly all eels were observed in pools near the base of the dam or climbing the bedrock falls immediately downstream of the dam and stop-log gates on river right (Figure 9). Most eels ranged from approximately 75 to 150 millimeters (mm) (3 to 6 inches); one yellow eel (600 mm or 24 inches) was observed in the plunge pool below the

dam, and one 300-mm (12-inch) eel was seen in the pool below the dam on the river left (Table 18).

TABLE 18 SUMMARY OF NIGHTTIME JUVENILE EEL MONITORING AT THE LOWER BARKER DAM IN JUNE, JULY, AND AUGUST 2015

DATE	START TIME	END TIME	RIVER RIGHT IN POOLS	RIVER RIGHT ON BEDROCK	RIVER LEFT IN POOL	LENGTH (MM)
June 9	20:40	22:15	0	0	0	
June 11	20:35	21:45	0	0	0	–
June 16	20:45	22:05	5	5	0	100-150 (4-6 inches)
June 18	20:35	21:30	0	0	0	–
June 25	21:10	22:05	0	0	0	–
July 7	20:35	21:45	4	0	1	3 eels 75-150 mm (3-6 inches), 1 eel 300 mm (12 inches), 1 eel 600 mm (24 inches)
July 9	20:45	21:50	0	0	0	–
July 14	21:00	22:10	14	10	0	75-150 (3-6 inches)
July 16	20:55	21:45	1	0	0	–
July 29	–	–	1	0	0	–
August 5	–	–	3	0	0	–
		TOTAL	**28**	**15**	**1**	

FIGURE 9 PRIMARY LOCATION (AREA WITHIN WHITE CIRCLE) OF OBSERVED JUVENILE EELS AT LOWER BARKER DAM IN 2015

4.4 SUMMARY

KEI (Maine) completed 11 nighttime surveys in June, July, and August 2015 to identify where juvenile American eels congregate below the Lower Barker dam or attempt to migrate past the dam. All surveys were conducted following the schedule and methods outlined in the final study plan. A small number of eels was observed (44); most within pools and along bedrock falls on river right. In recent years, researchers have documented few eels in the Androscoggin River. For example, the licensee of the Worumbo Project captured and passed 17 eels and 131 eels during 2012 and 2013, respectively (Miller Hydro Group 2013, Miller Hydro Group 2014). In comparison to other river systems in Maine, the number of eels observed at the Lower Barker Project is very low. For example, over 1,000 juvenile eels were observed during similar monitoring in 2015 at the American Tissue Project on Cobbosseecontee Stream in Gardiner, Maine (Kleinschmidt 2015). Furthermore, American eels were one of the predominant species in riverine reaches of the Kennebec River compared to the Androscoggin River where juvenile eels were only documented downstream of Brunswick (MBI 2006). The few eels at the Lower Barker Project and at downstream dams may not warrant installing an upstream eel passage system at this time.

5.0 BYPASSED REACH MINIMUM FLOW STUDY

5.1 INTRODUCTION

During scoping and consultation in 2014, the USFWS, MDMR, NMFS, Maine Department of Inland Fisheries and Wildlife (MDIFW), and the MDEP requested that KEI (Maine) conduct an instream flow study in the bypassed reach (i.e., the reach between the dam and the powerhouse) to evaluate habitat suitability for brown trout, rainbow trout, and Atlantic salmon under a range of flow releases from the dam. The objectives of the study, which was completed in two phases, were to:

- map and document existing available aquatic habitat in the bypassed reach; select transects for the instream flow study (Phase 1); and
- evaluate the relationship between river flow and habitat suitability in the bypassed reach for Atlantic salmon, brown trout, and brook trout and assess the available habitat and impediments to passage at selected transects across a range of flow releases (Phase 2).

KEI (Maine) operates the Lower Barker Project as run-of-river (i.e., inflow to the dam matches outflow from the powerhouse). Run-of-river operations protect aquatic resources by minimizing water level fluctuations in the impoundment and providing stable river flows downstream of the powerhouse. Water used for generation is discharged back into the Little Androscoggin River approximately 3,000 feet downstream of the Lower Barker dam, creating a riverine bypassed reach. KEI (Maine) currently provides a minimum flow of 20 cfs from the dam. Leaks at the gates and through the flashboards provide additional water to the bypassed reach during non-spill conditions. The original minimum flow requirement was developed during the original licensing proceedings in the 1980s to protect aquatic and fishery resources.

KEI (Maine) generates electricity at river flows ranging from approximately 150 cfs to 500 cfs, which are the turbine's approximate minimum and maximum hydraulic capacities. When there is not enough water to generate or if the turbine's maximum hydraulic capacity is exceeded, KEI (Maine) passes water through the stop-log gates or over the dam into the bypassed reach. River flow typically exceeds the maximum capacity of the turbine 38 percent of the year and is less than the minimum capacity of the turbine approximately 22 percent of the year (Table 19). Therefore, river flow in the bypassed reach as a result of spill over the dam, is typically greater

than the 20 cfs minimum flow approximately 60 percent of any given year, depending on water-year type, and 68 to 78 percent from July through September (Table 19). This was determined by comparing USGS gage data (1985-2015) at South Paris (prorated to the site) to the maximum and minimum operational capacity of the Lower Barker Project (150 and 500 cfs). Median monthly river flow in the bypassed reach ranges from 83 cfs in September to 1,364 cfs in April (Table 19).

TABLE 19 PERCENTAGE OF TIME BY MONTH THAT RIVER FLOW IS OUTSIDE THE HYDRAULIC CAPACITY (150 – 500 CFS), LOWER BARKER PROJECT

MONTH	PERCENT OF TIME < 150 CFS	PERCENT OF TIME > 500 CFS	CUMULATIVE PERCENT	MEDIAN MONTHLY RIVER FLOW
January	8%	22%	30%	306
February	10%	15%	25%	282
March	5%	55%	60%	574
April	0%	94%	94%	1,364
May	1%	68%	69%	676
June	16%	32%	48%	343
July	52%	16%	68%	141
August	61%	13%	74%	92
September	70%	8%	78%	83
October	31%	27%	58%	248
November	4%	54%	58%	535
December	2%	46%	48%	467
Annual Average	**22%**	**38%**	**60%**	**-**

Source: daily average river flow from 1985 to 2015 prorated from USGS Gage No. 01057000, South Paris, Maine

The MDIFW's fishery management goal for the lower Androscoggin River, including the bypassed reach associated with Lower Barker Project, is to develop a trout fishery that persists during the open water season from April 1 – October 31 (MDIFW study request letter to the Commission, June 17, 2014). The MDIFW stocked the bypassed reach with brook and brown trout until 2000, at which point stocking was suspended. The MDIFW currently stocks brown and rainbow trout upstream of the Lower Barker Project in Auburn, Minot, and Mechanic Falls. Approximately 22,000 brown and rainbow trout were stocked in 2013 and 2014 to support a put-grow-and-take fishery; approximately 4,100 brown and rainbow trout were stocked in 2015 and 2016 (MDIFW 2016). Atlantic salmon, a federally protected species, occurred historically in the

Little Androscoggin River. In 2011, MDMR completed a radio-telemetry study evaluating Atlantic salmon habitat use and fish passage in the lower Androscoggin River. MDMR documented one adult Atlantic salmon and some potential spawning habitat in the bypassed reach below the Lower Barker dam (MDMR 2011).

5.2 HABITAT MAPPING AND TRANSECT SELECTION (PHASE 1)

5.2.1 METHODS

KEI (Maine) completed the first phase of the instream flow study on July 7, 2015. Staff from the USFWS and MDIFW participated in the survey. River flow as measured at the South Paris gage (USGS Gage No. 01057000) was approximately 55 cfs; this equates to a river flow of approximately 270 cfs at the dam. KEI (Maine) was generating at the Lower Barker Project during the survey; water released through the minimum flow gate, leakage through gates, and some spill over the top of the dam provided water to the bypassed reach during the survey.

Researchers waded downstream from the dam to the confluence with the tailwater pool to identify and map aquatic mesohabitats (e.g., pool, riffles, runs) based on their predominant physical and hydrologic characteristics. Within each mesohabitat, surveyors measured water depth and stream width, identified dominant and secondary substrate types, looked for potential spawning gravel for salmonid species (e.g., rainbow trout, brown trout, and Atlantic salmon), established global positioning system (GPS) points at the top and bottom of each mesohabitat unit, and took photographs. KEI (Maine) submitted a Phase 1 summary memo report to the stakeholders on July 24, 2015.

5.2.2 RESULTS

The total length of the Little Androscoggin River between the dam and the powerhouse is approximately 3,000 feet, and the reach contains eight individual mesohabitat units (Table 20). Most of the habitat in the reach is riffle (46.7 percent) and pool (46.3 percent); the remainder is run (3.7 percent) and bedrock falls (3.3 percent) (Figure 10).

TABLE 20 RIVERINE MESOHABITAT TYPES IN THE BYPASSED REACH DOWNSTREAM OF THE LOWER BARKER DAM

UNIT #	HABITAT TYPE	PREDOMINANT SUBSTRATES	LENGTH (FEET)	BANK TO BANK WIDTH (FEET)	MAXIMUM DEPTH (FEET)*
1	Bedrock falls below dam	Bedrock	100	50	4 (plunge pool)
2	Plunge pool beneath dam	Bedrock	40	140	> 6
3	Riffle – moderate gradient /rapid	Bedrock and large boulder	175	110	4
4	Run	Large and small boulder	110	120	5
5	Riffle – low gradient; braided channel	Small boulder and cobble	825	130	2
6	Riffle with spawning gravels – low gradient	Cobble and gravel	280	100	2
7	Pool	Sand, fines	1,350	150	> 4
8	Riffle – low gradient	Large and small boulder	120	100	2
Total Length (feet)			**3,000**		

* at the time of the survey

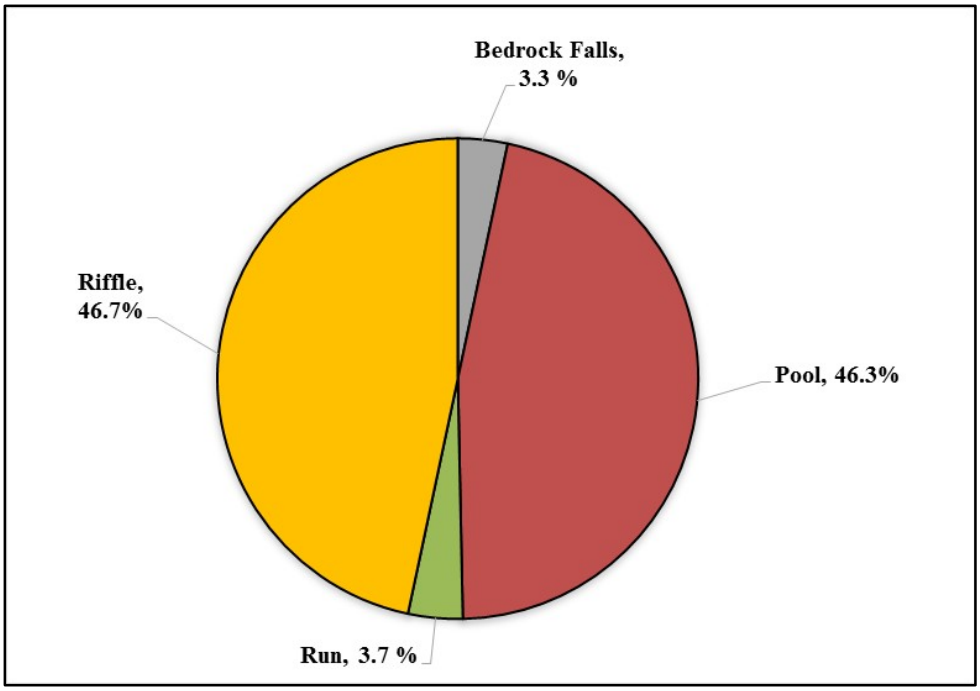


FIGURE 10 TYPE AND PERCENTAGE OF MESOHABITAT IN THE LOWER BARKER PROJECT BYPASSED REACH

The first 300 feet of the reach closest to the dam has a moderate to high gradient, after which the reach becomes primarily a low gradient, braided channel. The braided channel then converges in the lower third of the reach. Portions of Habitat Unit 6 contain some gravel beds that may be suitable for salmonid spawning (i.e., small to medium sized gravel, approximately 0.5 inch to 2 inches in diameter, low embeddedness); however, substrate in the bypassed reach as a whole is predominantly bedrock, large and small boulders, and large cobble. There are also some smaller gravels and cobbles at the tail end of Unit 7.

Transect Selection – KEI (Maine) identified three river transects with the USFWS and MDIFW during the habitat mapping survey. The transects were within Habitat Unit 4 (run), Habitat Unit 5 (low-gradient riffle), and Habitat Unit 6 (low gradient riffle) (Figure 11); these transect locations were selected because they were representative of the reach as a whole. Transect 3 was within Habitat Unit 6, which included the section that had some potential salmonid spawning gravel (Figure 11). KEI (Maine) also established a fourth transect just upstream of the powerhouse to gage river flows released from the dam; this transect was only used for stream gaging and for measuring wetted widths (Figure 11).

5.3 INSTREAM FLOW STUDY (PHASE 2)

KEI (Maine) completed Phase 2 of the study in June 2016. Staff from USFWS, NMFS, MDIFW, MDEP, and MDMR were invited to attend; staff from MDIFW and MDEP participated in portions of the Phase 2 of the study. Given the narrow operational window and overall dry weather conditions in 2016, scheduling field efforts in a manner that worked for those interested was challenging. Appendix D provides an account of the logistical arrangements and study coordination for the field study.

5.3.1 METHODS

Target Flow Releases – KEI (Maine) used standard hydraulic engineering calculations (Appendix E) to determine how much to open the deep flood gates to provide the target flows for the study, which were 20, 50, 100, 175, and 300 cfs. Researchers measured each flow released from the dam at transect 4 with a Marsh McBirney flow meter; this transect was selected for gaging because it had laminar flow from bank to bank, which allowed for the most accurate measurements of velocity, depth, and discharge. Adjustments to the gate settings were made as

needed to attain the target flow based on the stream gaging. In some instances, additional water (i.e., leaks from the dam) were included in the measurements. Table 21 provides a summary of the flows that were released and measured in the field.

TABLE 21 COMPARISON OF TARGET AND ACTUAL FLOW RELEASES, LOWER BARKER PROJECT INSTREAM FLOW STUDY

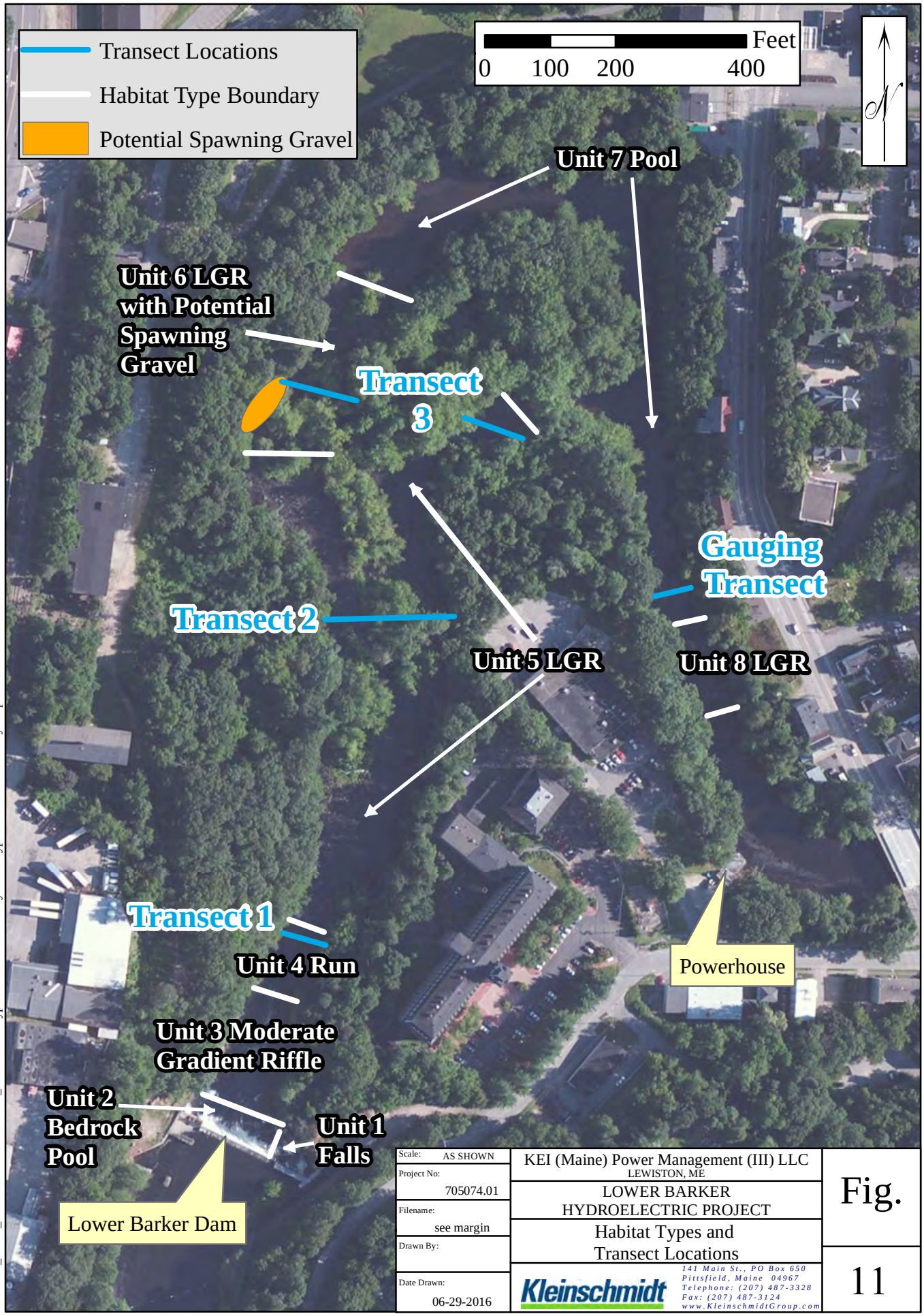
RELEASE NO.	TARGET FLOW (CFS)	GAGED FLOW AND LEAKAGE (CFS)
1	20	35
2	50	46
3	100	108
4	175	197
5	300	301

Habitat Criteria for Representative Fish Species - As put forward in the study plan, KEI (Maine) used Atlantic salmon fry, parr,[6] and spawning adults; adult brown trout; and adult rainbow trout to evaluate the relationship between river flow in the bypassed reach and suitable aquatic habitat. Each of these species and life stages has habitat suitability criteria (i.e., preferred water depth, water velocity, and substrate conditions), which are described in published habitat suitability index (HSI) data (Appendix F). For adult rainbow and brown trout, the HSI criteria for velocity are dependent on the availability of velocity refugia (i.e., few or abundant velocity refugia); each transect was evaluated independently using any of the following criteria for abundant refugia:

- Large boulder > 25 percent of substrate;
- Small boulder > 75 percent of substrate; or
- Instream cover > 50 percent (Appendix F).

Based on this criteria, the abundant velocity refugia HSI were applied to transect 1, and the few velocity refugia HSI were applied to transects 2 and 3.

[6] Age 1 or 2 juvenile Atlantic salmon; fry are juvenile salmon that have just emerged from spawning gravel



Path: G:_Client_Data\KEI\Lower Barker_MXD\2015 Bypass Reach Flow Study\2016 Bypass Reach Flow Study Map.mxd

Source: KEI, Kleinschmidt, ESRI

Scale: AS SHOWN	KEI (Maine) Power Management (III) LLC LEWISTON, ME
Project No: 705074.01	LOWER BARKER HYDROELECTRIC PROJECT
Filename: see margin	Habitat Types and Transect Locations
Drawn By:	
Date Drawn: 06-29-2016	Kleinschmidt 141 Main St., PO Box 650 Pittsfield, Maine 04967 Telephone: (207) 487-3328 Fax: (207) 487-3124 www.KleinschmidtGroup.com

Fig. 11

Transect Habitat Data Collection – Prior to the releases of water from the dam, KEI (Maine) established temporary habitat transect lines that ran from the right bank to the left bank of the river. A marked measuring tape was attached to each line so that known "stations" could be established across transects. During each flow release from the dam, KEI (Maine) collected water depth (feet) and mean column water velocity (feet per second) data at approximately 2 to 4 foot intervals (i.e., stations) along each established transect and at distinct changes in microhabitat conditions (e.g., changes in substrate or notable differences in water depth or water velocity). Measurements of depth and velocity were taken at the same station along each transect during each flow release. KEI (Maine) also collected substrate information at each station during the low flow releases, measured the wetted stream width at each transect at each flow release, established temporary stream staff gages to confirm that each target flow stabilized prior to transect data collection, and photographed each transect at each flow release. Photographs of each transect at each flow release were taken from the same or similar vantage point. Appendix A provides photographs of each transect at each flow release.

Data Analysis – All field data were entered into a Microsoft Excel database. Depth, velocity, and substrate data collected in the field were then compared to habitat suitability criteria of target life stages of Atlantic salmon, brown trout, and rainbow trout. KEI (Maine) used a look up function in Excel to assign a suitability ranking between 0.0 (unsuitable) to 1.0 (optimal) for each individual measurement of depth, velocity, and substrate across each transect for each species and life stage. The product of the depth, velocity, and substrate suitability ranking values was generated to arrive at a composite suitability value for each station along each transect. These composite values were then summed across each transect and for all transects cumulatively to generate a total habitat suitability value for each flow release for each species and life stage. Tabular summaries and charts were then developed showing the relationship between discharge and habitat suitability for each flow release and for each species and life stage. Habitat suitability values for 0, 20, and 175 cfs were calculated based on the slope of the data from the five releases. The available habitat data for each fish species and life stage were fitted with regression curves using Microsoft Excel to interpolate between known data points and to extrapolate values outside of the range of the known data. Various regression methods were tested for each set of data and equations that maximized the goodness of fit to the data were selected (i.e., the R^2 statistical metric) as best as possible without losing the general trend of the

data (i.e., a regression equation may have provided a better R^2, but if the shape of the curve did not follow the general trend of the data it was not selected).

MDEP Wetted Cross Sectional Width – The MDEP's guidelines are that at least 75 percent of the cross section of a river must be wetted at all times for aquatic life structure and function to be maintained in a free-flowing river or stream. To address MDEP's policy for the bypassed reach, KEI (Maine):

- surveyed the river bed elevation of transect 2 and transect 4;
- measured the wetted widths at transect 2 and transect 4 at each of the five flows released from the dam;
- determined the elevation of the water surface at transect 2 and transect 4 at each of the five flows released from the dam; and
- measured the width of the river channel at its bankfull elevation at transect 2 and transect 4.

Transect 2 and 4 were selected because the geometry of the river bank was such that the bankfull elevation could be readily determined. KEI (Maine) estimated the channel's bankfull width visually at transect 2 and 4 using standard bankfull indicators (e.g., obvious breaks in slope topography, presence of permanent vegetation, roots). The river right bank of transect 1 was altered by construction of a large stone retaining wall, and transect 3 traversed four separate channels; therefore, these transects were not suitable for determining the wetted width or bankfull channel elevation. Appendix A provides photographs of the location along the transects that were used to determine the bankfull channel width. The wetted width was then compared to the bankfull width to determine the percentage of the river bed that was wetted at each release. Because KEI (Maine) operates the Lower Barker Project as run-of-river, the Little Androscoggin River downstream of the powerhouse is not affected by operations; therefore, KEI (Maine) collected no wetted width measurements downstream of the powerhouse.

5.3.2 RESULTS

Habitat Suitability – The results demonstrate that the existing minimum flow (20 cfs) provides some suitable habitat throughout the reach for trout and salmon; however, habitat suitability

increased for all species and life stages at higher flows released from the dam (Figure 12). In summary:

- The existing minimum flow of 20 cfs will maintain 70 to 82 percent of available suitable aquatic habitat for Atlantic salmon fry and parr, no adult spawning habitat; and 18 to 24 percent available suitable aquatic habitat for adult rainbow and brown trout (Figure 12 and Table 22).
- A flow of 35 cfs provides 70 to 81 percent of available suitable aquatic habitat for Atlantic salmon fry and parr; 8.4 percent of available adult spawning habitat; and 22 to 28.5 percent available suitable aquatic habitat for adult rainbow and brown trout (Figure 12 and Table 22).
- A flow of 46 cfs provides 82 to 90 percent of available suitable aquatic habitat for Atlantic salmon fry and parr; 20 percent of available adult spawning habitat; and 35 to 40 percent available suitable aquatic habitat for adult rainbow and brown trout (Figure 12 and Table 22).
- A flow of 108 cfs (100 plus leaks) provides 96 to 100 percent of available suitable aquatic habitat for Atlantic salmon fry and parr; 61 percent of available adult spawning habitat; and 66 to 72.5 percent available suitable aquatic habitat for adult rainbow and brown trout (Figure 12 and Table 22).
- A flow of 175 cfs provides 99 to 100 percent of available suitable aquatic habitat for Atlantic salmon fry and parr; 90.5 percent of available adult spawning habitat; and 83 to 89 percent available suitable aquatic habitat for adult rainbow and brown trout (Figure 12 and Table 22).
- A flow of 197 cfs provides 96 to 97 percent of available suitable aquatic habitat for Atlantic salmon fry and parr; 96 percent of available adult spawning habitat; and 83 to 89 percent available suitable aquatic habitat for adult rainbow and brown trout (Figure 12 and Table 22).
- A flow of 301 cfs provides 89 to 91.5 percent of available suitable aquatic habitat for Atlantic salmon fry and parr; 100 percent for adult salmon; and 100 of the percent available suitable aquatic habitat for adult rainbow and brown trout (Figure 12 and Table 22).
- All flows released from the dam provided 70 to 100 percent of the available suitable habitat for Atlantic salmon fry and parr (Figure 12 and Table 22).
- Habitat suitability increased for Atlantic salmon fry and parr until the release of 108 cfs (100 cfs plus leaks), after which it increased in small increments or became less suitable (Figure 12 and Table 22).
- Habitat suitability increased for Atlantic salmon spawning adults and adult brown trout until 175 cfs, after which it either remained essentially unchanged or increased at more gradual rates at the higher flows (Figure 12 and Table 22).
- Habitat suitability increased for adult rainbow trout until 175 cfs, at which point it flattened out until 197 cfs, after which additional gains in habitat suitability occurred (Figure 12 and Table 22).

- The biggest increases in habitat suitability for all five species and life stages occurred between 46 cfs and 108 (i.e., 100 cfs plus leaks) (Figure 12 and Table 22). Habitat suitability increased by approximately 10 percent for Atlantic salmon fry, 14 percent for Atlantic salmon parr, 33 percent for adult brown trout, 31 percent for adult rainbow trout, and 41.5 percent for spawning Atlantic salmon between these two releases (Figure 12 and Table 22).

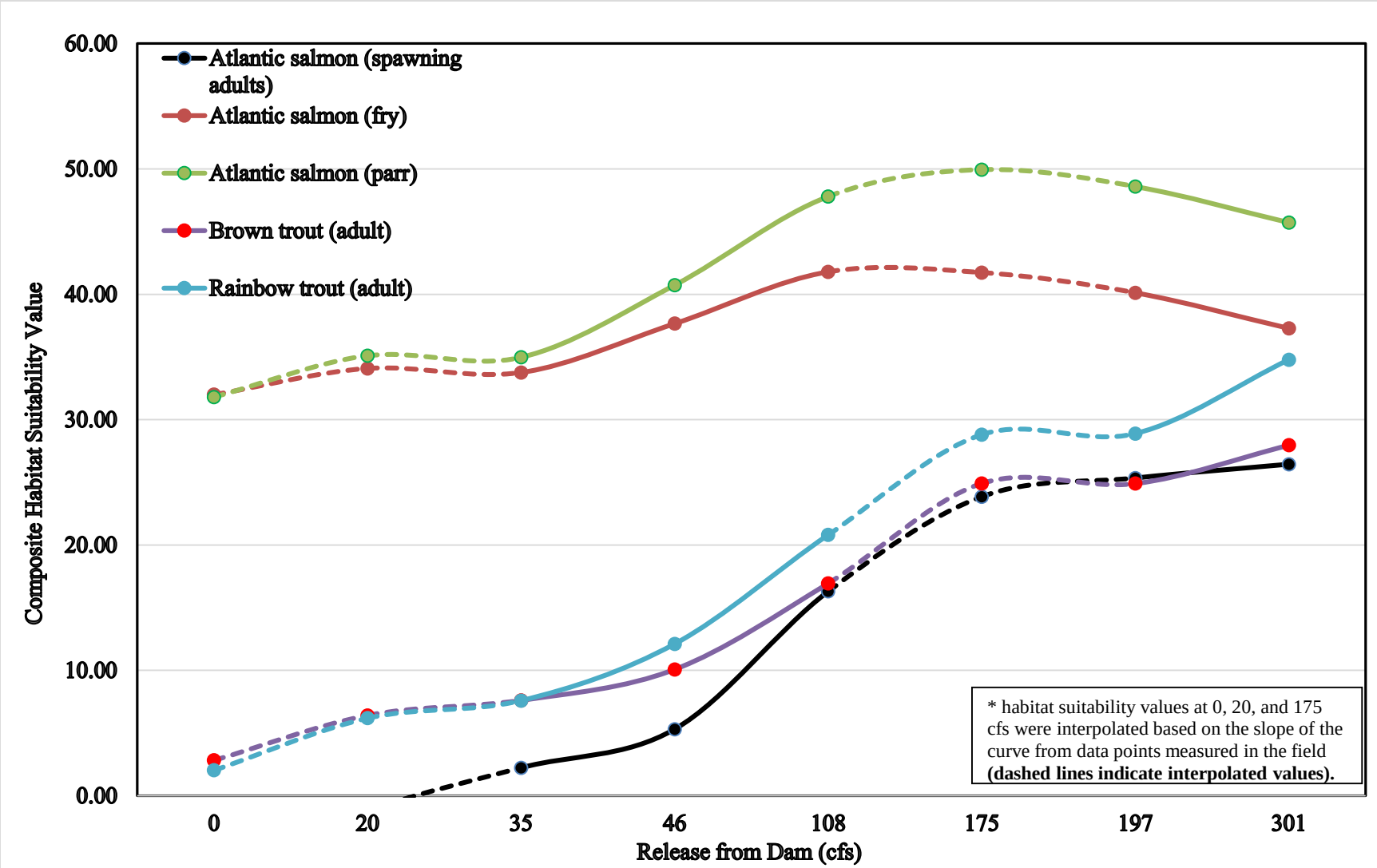


FIGURE 12 HABITAT SUITABILITY CURVES FOR ATLANTIC SALMON, BROWN TROUT, AND RAINBOW TROUT, LOWER BARKER PROJECT, LITTLE ANDROSCOGGIN RIVER

TABLE 22 HABITAT SUITABILITY, PERCENT INCREASE, AND CUMULATIVE INCREASE IN HABITAT SUITABILITY IN THE LOWER BARKER PROJECT BYPASSED REACH

ALL TRANSECTS SUITABLE HABITAT (COMPOSITE)								
SPECIES/LIFE STAGE	**0 CFS***	**20 CFS***	**35 CFS**	**46 CFS**	**108 CFS**	**175 CFS***	**197 CFS**	**301 CFS**
Atlantic salmon (spawning adults)	0.0	0.0	2.2	5.3	16.3	23.9	25.3	26.4
Atlantic salmon (fry)	32.0	34.1	33.8	37.7	41.8	41.7	40.1	37.3
Atlantic salmon (parr)	31.8	35.1	35.0	40.7	47.8	50.0	48.6	45.7
Brown trout (adult)	4.0	6.6	8.0	11.1	20.3	24.9	24.9	28.0
Rainbow trout (adult)	2.0	6.1	7.6	12.1	22.9	28.8	28.9	34.8
PERCENT OF MAXIMUM SUITABILITY								
SPECIES/LIFE STAGE	**0 CFS***	**20 CFS***	**35 CFS**	**46 CFS**	**108 CFS**	**175 CFS***	**197 CFS**	**301 CFS**
Atlantic salmon (spawning adults)	0.0%	0.0%	8.4%	20.1%	61.6%	90.5%	95.8%	100.0%
Atlantic salmon (fry)	76.6%	81.6%	80.8%	90.1%	100.0%	99.9%	96.0%	89.2%
Atlantic salmon (parr)	63.6%	70.2%	70.0%	81.5%	95.6%	100.0%	97.2%	91.5%
Brown trout (adult)	14.2%	23.6%	28.5%	39.7%	72.5%	89.1%	89.1%	100.0%
Rainbow trout (adult)	5.9%	17.6%	21.8%	34.8%	65.8%	82.8%	83.1%	100.0%
CUMULATIVE PERCENT INCREASE								
SPECIES/LIFE STAGE	**0 CFS***	**20 CFS***	**35 CFS**	**46 CFS**	**108 CFS**	**175 CFS***	**197 CFS**	**301 CFS**
Atlantic salmon (spawning adults)	-	0.0%	8.4%	11.7%	41.5%	28.9%	5.3%	4.2%
Atlantic salmon (fry)	-	5.0%	-0.8%	9.3%	9.9%	-0.1%	-3.9%	-6.8%
Atlantic salmon (parr)	-	6.6%	-0.3%	11.5%	14.2%	4.4%	-2.8%	-5.7%
Brown trout (adult)	-	9.4%	4.9%	11.1%	32.9%	16.6%	0.0%	10.9%
Rainbow trout (adult)	-	11.7%	4.2%	13.0%	31.0%	17.1%	0.2%	16.9%

* interpolated values based on slope of curve from five flow releases in the field

MDEP Wetted Cross Section Width – All five flows at transect 4 wetted more than 75 percent of the bankfull width (Table 23). Four releases (46, 108, 197, and 301) wetted more than 75 percent of the bankfull width at transect 2; the low flow release of 35 cfs (i.e., 20 cfs plus leaks) wetted approximately 73 percent of the bankfull width at transect 2 (Table 23).

TABLE 23 WETTED WIDTH COMPARED TO BANKFULL WIDTH, LOWER BARKER PROJECT INSTREAM FLOW STUDY

	FLOW RELEASE (CFS)	**PERCENT BANKFULL WIDTH**
Transect 2	35	73.1%
	46	78.2%
	108	90.8%
	197	92.7%
	301	93.6%
Transect 4	35	77.8%
	46	77.8%
	108	83.3%
	197	88.9%
	301	92.2%

5.4 DISCUSSION

The 3,000-foot river reach between the Lower Barker dam and powerhouse provides a variety of aquatic habitats for fish and other organisms. The reach also provides angling and recreational activities. Dry summer conditions typically result in low river levels in the Little Androscoggin River (i.e., summer baseflow conditions) as compared to other times of the year. Often a river channel will become narrow and confined, restricted to the deepest portions of the channel during low-flow periods, becoming recharged intermittently following precipitation. Aquatic organisms have adapted over time to summer baseflow conditions (Lang 1999). KEI (Maine) operates the Lower Barker Project between approximately 150 and 500 cfs during normal operations. Because of this narrow operational window, water is often diverted into the bypassed reach through gates or over the spillway when river flow is less than or exceeds the hydraulic capacities of the turbine unit. On average, this occurs from 68 to 78 percent of the time during July, August, and September, depending on water year. As such, KEI (Maine) provides a considerable amount of water to the reach when the Lower Barker Project is inoperable.

The results of the instream flow study demonstrate that the biggest improvements in habitat suitability in the bypassed reach for Atlantic salmon, brown trout, and rainbow trout occur up to a river flow of approximately 108 cfs (100 cfs plus leakage). At higher river flows, habitat suitability does not improve, decreases slightly, or increases at a more gradual rate. River flows of approximately 40 to 45 cfs are expected to keep at least 75 percent of the bypassed reach channel wetted.

A minimum flow for the bypassed reach needs to take into account habitat use by target species and life stages throughout the year, the availability of water throughout the year, the varying hydrology during each bio-period of interest, and operational constraints (Bovee et al. 1998). Different species and life stages often have conflicting habitat and flow requirements. For example, adult trout and juvenile salmon have the potential to occur in the Little Androscoggin River at the same time, but each has different habitat requirements. Table 24 shows the timeframe that target species and life stages would be expected to occur in the bypassed reach, if salmon restoration is successful at some point in the future and if MDIFW stocks the reach in the future; this data is presented in comparison to monthly median river flow in the Little Androscoggin River from the South Paris USGS gage prorated to the site (period of record 1985-2015). Atlantic salmon spawning and egg incubation would occur between November and April

when river flow is relatively high as compared to the summer and fall months. Atlantic salmon fry would hatch and inhabit the reach during May and June; parr would potentially occupy the reach throughout the year, including summer months when flows are characteristically very low. The bypassed reach would likely be managed during the open water fishing season from April 1 through October 31 as a put-grow-take brown and rainbow trout fishery.

During the Atlantic salmon spawning and incubation season (November through April) naturally occurring median project inflow ranges between 282 cfs in February to 1,371 cfs in April (Table 24). During this time the project spills between 25 percent (February) to 96 percent (April) of the time (see Table 19), primarily during periods when inflow exceeds the hydraulic capacity of the Lower Barker Project. During the Atlantic salmon fry bio-period (i.e., May and June) naturally occurring median inflow ranges between 336 cfs in June to 676 cfs in May (Table 24) and the project spills 49 to 69 percent of the time, primarily during periods when inflow exceeds the hydraulic capacity of the Lower Barker Project.

TABLE 24 MONTHLY MEDIAN INFLOW AND HABITAT USE BY TARGET SPECIES AND LIFE STAGES

MONTH	MEDIAN FLOW (CFS)	ATLANTIC SALMON SPAWNING	ATLANTIC SALMON FRY	ATLANTIC SALMON PARR	BROWN TROUT	RAINBOW TROUT
January	306	X		X	X	
February	282	X		X	X	
March	574			X	X	
April	1,364			X	X	X
May	676		X	X	X	X
June	343		X	X	X	X
July	141			X	X	X
August	92			X	X	X
September	83			X	X	X
October	248			X	X	X
November	535	X		X	X	
December	467	X		X	X	

* Highlighted median flow values indicate the naturally occurring, low flow month in various bio-periods for target species in the Little Androscoggin River

Throughout the rest of the year (i.e., July through October), median monthly river flow ranges from 83 cfs in September to 248 cfs in October (Table 24). The Lower Barker Project typically spills 58 to 78 percent of the time during these summer and fall months (Table 19), primarily during periods when inflow is less than the minimum operating capacity of the Lower Barker

Project. Unlike many New England rivers, the Little Androscoggin naturally occurring, low median monthly flow occurs in September rather than August.

During the summer months (July – September), the monthly median inflow falls to 83 cfs, and the Lower Barker Project spills up to 78 percent of the time (whenever inflow falls below the minimum turbine hydraulic efficiency of 150 cfs). KEI (Maine) often diverts all water to the bypassed during this period. This flow is the naturally-occurring habitat suitability "bottleneck" that defines effectively available and ecologically protective habitat suitability during the summer. According to Lang (1999): "Low flow conditions …typically represent a natural limiting period…. Over the long term, stream flora and fauna have evolved to survive these adversities without major population changes."

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APPENDIX A

TRANSECT PHOTOGRAPHS
FOR
INSTREAM FLOW STUDY

BANKFULL PHOTOS

Photo A1. Transect 2 River Right Bankfull Station

Photo A2. Transect 2 River Left Bankfull Station

Photo A3. Transect 4 River Right Bankfull Station

Photo A4. Transect 4 River Left Bankfull Station

TRANSECT 1 PHOTOS

Photo A5. Transect 1 35 cfs upstream

Photo A6. Transect 1 35 cfs across

Photo A7. Transect 1 35 cfs downstream

Photo A8. Transect 1 46 cfs upstream

Photo A9. Transect 1 46 cfs across

Photo A10. Transect 1 46 cfs downstream

Photo A11. Transect 1 108 cfs upstream

Photo A12. Transect 1 108 cfs across

Photo A13. Transect 1 108 cfs downstream

Photo A14. Transect 1 197 cfs upstream

Photo A15. Transect 1 197 cfs across

Photo A16. Transect 1 197 cfs downstream

Photo A17. Transect 1 301 cfs upstream

Photo A18. Transect 1 301 cfs across

Photo A19. Transect 1 301 cfs downstream

TRANSECT 2 PHOTOS

Photo A20. Transect 2 35 cfs channel A upstream

Photo A21. Transect 2 35 cfs channel A across

Photo A22. Transect 2 35 cfs channel A downstream

Photo A23. Transect 2 35 cfs channel B upstream

Photo A24. Transect 2 35 cfs channel B across

Photo A25. Transect 2 35 cfs channel B downstream

Photo A26. Transect 2 46 cfs channel A upstream

Photo A27. Transect 2 46 cfs channel A across

Photo A28. Transect 2 46 cfs channel A downstream

Photo A29. Transect 2 46 cfs channel B upstream

Photo A30. Transect 2 46 cfs channel B across

Photo A31. Transect 2 46 cfs channel B downstream

Photo A32. Transect 2 108 cfs channel A upstream

Photo A33. Transect 2 108 cfs channel A across

Photo A34. Transect 2 108 cfs channel A downstream

Photo A35. Transect 2 108 cfs channel B upstream

Photo A36. Transect 2 108 cfs channel B across

Photo A37. Transect 2 108 cfs channel B downstream

Photo A38. Transect 2 197 cfs channel A upstream

Photo A39. Transect 2 197 cfs channel A across

Photo A40. Transect 2 197 cfs channel A downstream

Photo A41. Transect 2 197 cfs channel B upstream

Photo A42. Transect 2 197 cfs channel B across

Photo A43. Transect 2 197 cfs channel B downstream

Photo A44. Transect 2 301 cfs channel A upstream

Photo A45. Transect 2 301 cfs channel A across

Photo A46. Transect 2 301 cfs channel A downstream

Photo A47. Transect 2 301 cfs channel B upstream

Photo A48. Transect 2 301 cfs channel B across

Photo A49. Transect 2 301 cfs channel B downstream

TRANSECT 3 PHOTOS

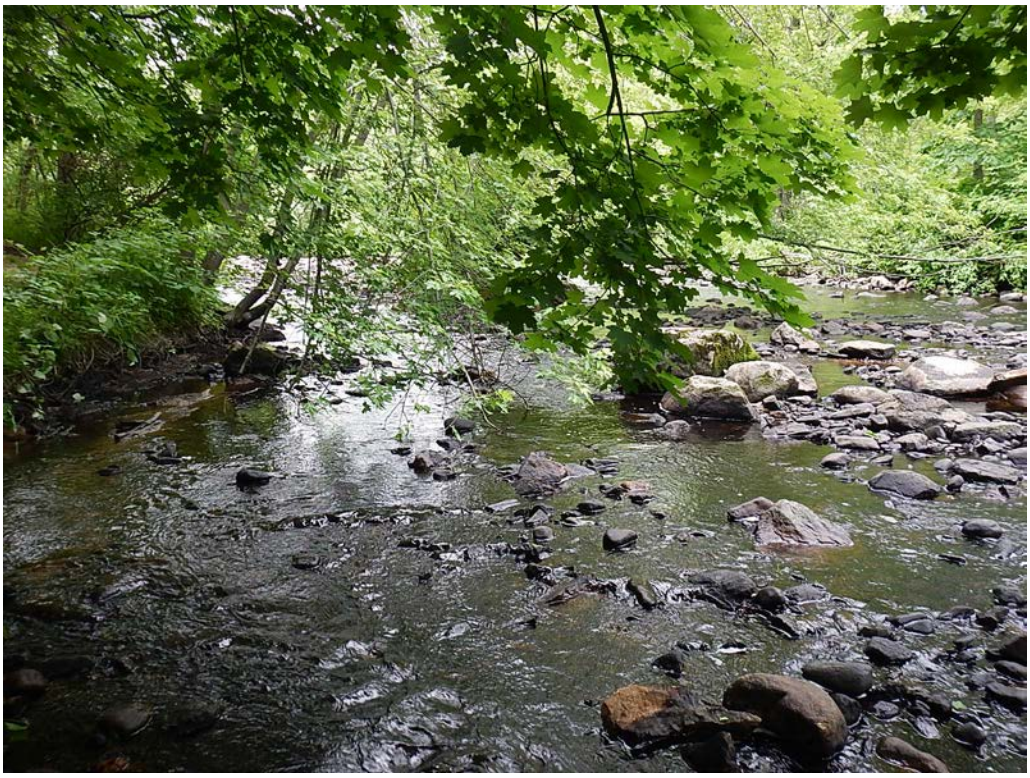

Photo A50. Transect 3 35 cfs channel A upstream

Photo A51. Transect 3 35 cfs channel A across

Photo A52. Transect 3 35 cfs channel A downstream

Photo A53. Transect 3 35 cfs channel B upstream

Photo A54. Transect 3 35 cfs channel B across

Photo A55. Transect 3 35 cfs channel B downstream

Photo A56. Transect 3 35 cfs channel C upstream

Photo A57. Transect 3 35 cfs channel C across

Photo A58. Transect 3 35 cfs channel C downstream

Photo A59. Transect 3 35 cfs channel D upstream

Photo A60. Transect 3 35 cfs channel D across

Photo A61. Transect 3 35 cfs channel D downstream

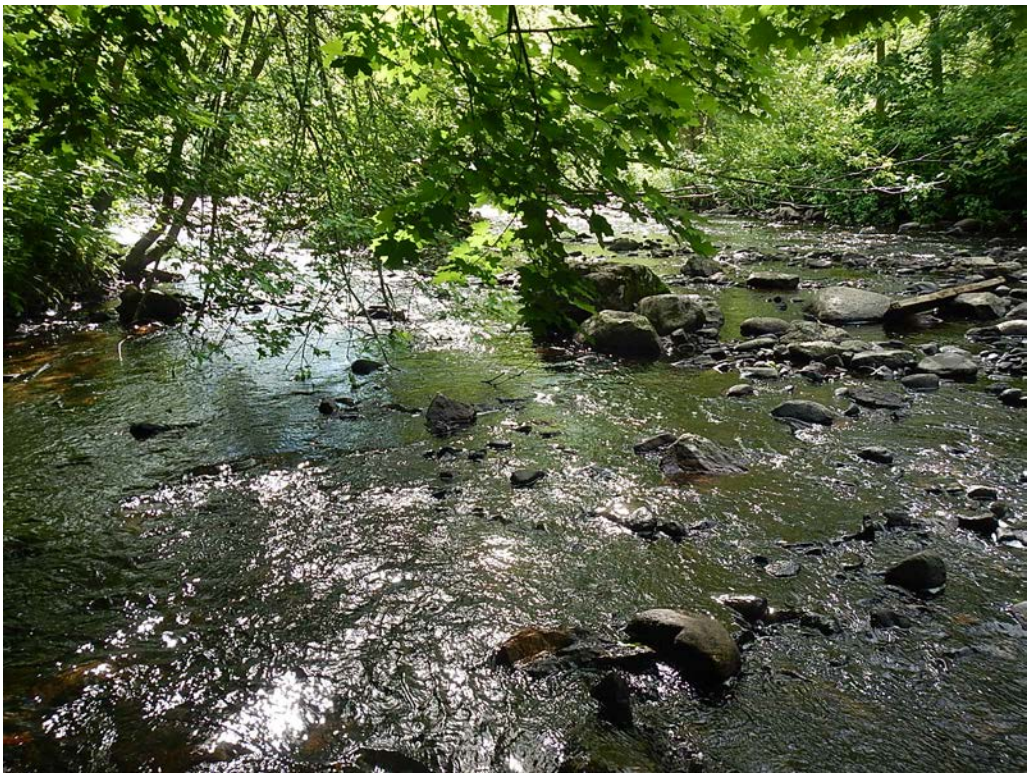

Photo A62. Transect 3 46 cfs channel A upstream

Photo A63. Transect 3 46 cfs channel A across

Photo A64. Transect 3 46 cfs channel A downstream

Photo A65. Transect 3 46 cfs channel B upstream

Photo A66. Transect 3 46 cfs channel B across

Photo A67. Transect 3 46 cfs channel B downstream

Photo A68. Transect 3 46 cfs channel C upstream

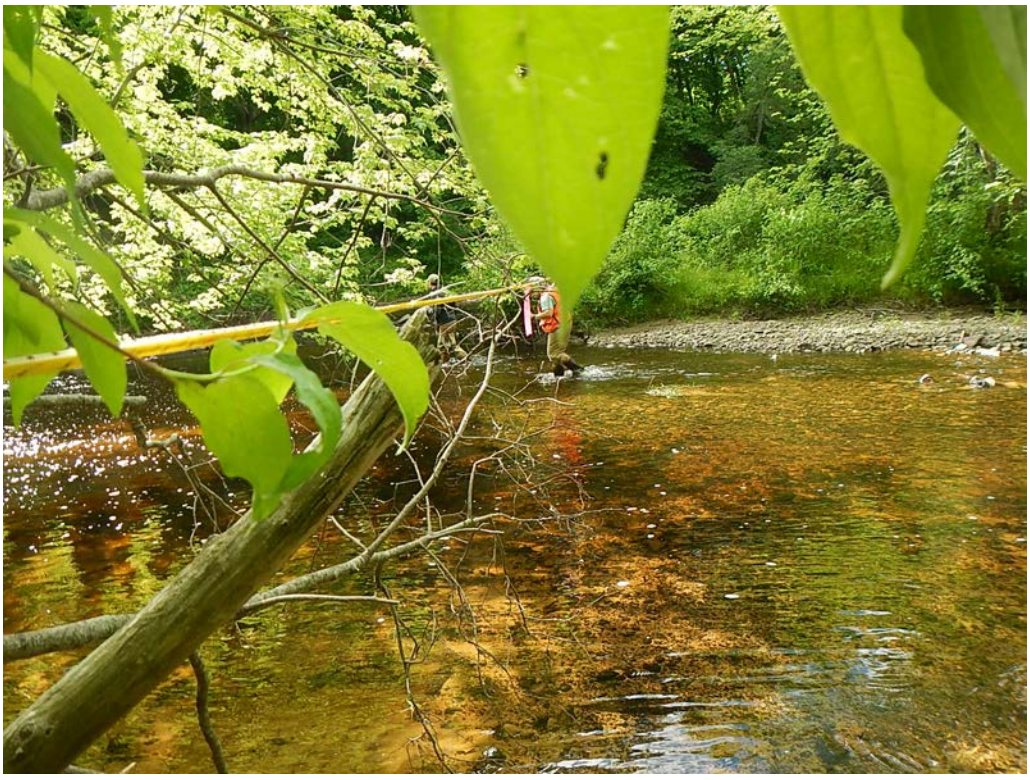

Photo A69. Transect 3 46 cfs channel C across

Photo A70. Transect 3 46 cfs channel C downstream

Photo A71. Transect 3 46 cfs channel D upstream

Photo A72. Transect 3 46 cfs channel D across

Photo A73. Transect 3 46 cfs channel D downstream

Photo A74. Transect 3 108 cfs channel A upstream

Photo A75. Transect 3 108 cfs channel A across

Photo A76. Transect 3 108 cfs channel A downstream

Photo A77. Transect 3 108 cfs channel B upstream

Photo A78. Transect 3 108 cfs channel B across

Photo A79. Transect 3 108 cfs channel B downstream

Photo A80. Transect 3 108 cfs channel C upstream

Photo A81. Transect 3 108 cfs channel C across

Photo A82. Transect 3 108 cfs channel C downstream

Photo A83. Transect 3 108 cfs channel D upstream

Photo A84. Transect 3 108 cfs channel D across

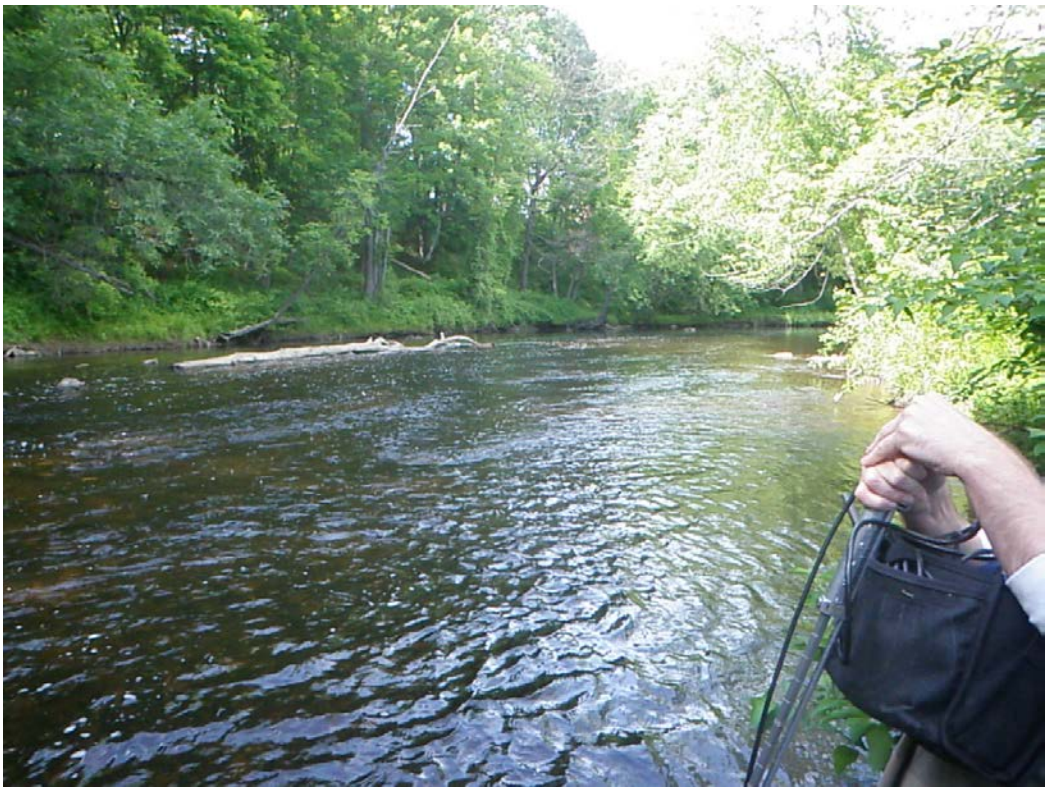

Photo A85. Transect 3 108 cfs channel D downstream

Photo A86. Transect 3 197 cfs channel A upstream

Photo A87. Transect 3 197 cfs channel A across

Photo A88. Transect 3 197 cfs channel A downstream

Photo A89. Transect 3 197 cfs channel B upstream

Photo A90. Transect 3 197 cfs channel B downstream

Photo A91. Transect 3 197 cfs channel C upstream

Photo A92. Transect 3 197 cfs channel C across

Photo A93. Transect 3 197 cfs channel D upstream

Photo A94. Transect 3 197 cfs channel D across

Photo A95. Transect 3 197 cfs channel D downstream

Photo A96. Transect 3 301 cfs channel A upstream

Photo A97. Transect 3 301 cfs channel A across

Photo A98. Transect 3 301 cfs channel C and D upstream

Photo A99. Transect 3 301 cfs channel D across

APPENDIX B

2014 AGENCY STUDY REQUESTS

Kelly Maloney

From: Reed, Robin K [robin.k.reed@maine.gov]
Sent: Tuesday, December 17, 2013 2:37 PM
To: Kelly Maloney
Cc: Mohney, Kirk; Spiess, Arthur
Subject: MHPC# 1671-13 Lower Barker Hydroelectric Project; FERC # 2808; Auburn, Maine; relicensing
Attachments: CARMA consultants.pdf; Contract Archaeology Guidelines.pdf

MHPC# 1671-13 Lower Barker Hydroelectric Project; FERC # 2808; Auburn, Maine; relicensing

Kelly:

In response to your recent request, our office has reviewed the information to initiate consultation on the above referenced project pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended.

In order to continue our review of this project, we require the following information:

1. Based on the information submitted, our office has concluded that the project area possibly contains one or more prehistoric archaeological sites based on our predictive model of archaeological site location. Therefore, Phase I archaeological survey is necessary for this parcel prior to any ground disturbance. A list of qualified prehistoric archaeologists may be found on our website: http://www.maine.gov/mhpc/project_review/consultants/prehistoric_archaeology.shtml Please find attached material explaining the Phase I/II/III approach to archaeological survey. This information can also be found on our website: www.maine.gov/mhpc/project_review This office must approve any proposal for archaeological fieldwork

2. Regarding above ground resources, architectural survey is required in order to identify and record information on all resources within the APE that are 50 years old or older, including the hydro facility itself. The APE for architectural resources must be clearly outlined on a USGS topographical map in consultation with our office. Survey must be completed according to our "Revised Above Ground Cultural Resource Survey Manual Project Review Specific." All surveys must now be submitted electronically via our new on-line CARMA database. See http://www.maine.gov/mhpc/architectural_survey/survey_guidelines.html for more information. On that webpage, please also review our "Project Review Survey Procedures." Please contact Christi Mitchell, our survey coordinator, at 287-1453 or christi.mitchell@maine.gov to schedule an appointment to review our files.

   Regarding conducting architectural survey, a list of historic preservation consultants is enclosed for your information and use. Our office encourages you to utilize consultants who meet the Secretary of the Interior's Professional Qualifications Standards (36 CFR Part 61, Appendix A), and who have a thorough understanding of the survey process and the National Register of Historic Places Criteria for eligibility. Generally these are architectural historians, but there are also professional standards for historians, architects and historic architects. While there certainly is some cross over between the categories, it is important to realize that having a broad and detailed knowledge of architectural styles, as represented in Maine, is crucial to completing a successful project efficiently. If you have questions about whether a particular firm has conducted survey for our office, please contact our survey coordinator, Ms. Mitchell.

3. In addition, an assessment of effects must be submitted to our office for historic properties (National Register listed, previously determined eligible and/or potentially eligible properties) that are identified, pursuant to the Section 106 regulations.

4. Please also forward us the contact information for your FERC reviewer.

We look forward to continuing consultation with you on this project.

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GOVERNOR

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DIRECTOR

CARMA TRAINED CONSULTANTS

Cultural Architectural Resource Management Archive

Historic Preservation Consultants List

The following list includes architectural and landscape historians, historians, and preservation planners who have attended a MHPC CARMA training session. An asterisk next to the name indicates the successful completion of an architectural survey project utilizing CARMA. Inclusion on this list does not represent an endorsement by the Maine Historic Preservation Commission.

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ANGUS S. KING, JR.
GOVERNOR

EARLE G. SHETTLEWORTH, JR.
DIRECTOR

CONTRACT ARCHAEOLOGY GUIDELINES

June 10, 2002

This document is provided as background information to agencies, corporations, professional consultants or individuals needing contract archaeological services (also known as Cultural Resources Management archaeology) in Maine. These guidelines are based on state rules (94-089 Chapter 812).

Finding an Archaeologist

At the time that MHPC issues a letter requiring archaeological survey work, MHPC will also supply one (or more) lists of archaeologists (Levels 1 and/or 2, historic or prehistoric) appropriate to the type of work (Phase I, II, III, historic or prehistoric). **Archaeologists on the Level 2 Approved Lists can do projects of any level, including Phase I archaeological survey projects.** Level 1 archaeologists are restricted to doing Phase I surveys, and certain planning projects for municipal governments.

MHPC maintains lists of archaeologists interested in working in different geographic areas of Maine, and those who are qualified in different types of work. The archaeologists themselves indicate their availability (except for short-term absence) to MHPC on a periodic basis, so archaeologists on the list can be expected to respond to inquiries. The applicant should solicit proposals or bids for work from archaeologists whose names appear on the list supplied by MHPC.

These archaeologists' names are taken from lists of archaeologists approved for work in Maine by MHPC under a set of rules establishing minimal qualifications, such as previous supervisory experience in northern New England, and an appropriate graduate degree. *However, the inclusion of an archaeologist on one of these lists should not be interpreted as an endorsement by the MHPC beyond these limited qualification criteria. Moreover, the MHPC cannot recommend the services of an individual archaeologist.*

Project Types

The vast majority of contract archaeology survey work falls into one of three categories. **Phase I** surveys are designed to determine whether or not archaeological sites exist on a particular piece of land. Such work involves checking records of previous archaeology in the area, walking over the landscape to inspect land forms and look for surface exposures of soil and possible archaeological material, and the excavation of shovel test pits in areas of high probability.

Phase II surveys are designed to focus on one or more sites that are already known to exist, find site limits by digging test pits, and determine site content and preservation. Information from Phase II survey work is used by the Maine Historic Preservation Commission (MHPC) to determine site significance (eligibility for listing in the National Register of Historic Places). **Phase III** archaeological work, often called data recovery, is careful excavation of a significant archaeological site to recover the artifacts and information it contains in advance of construction or other disturbance.

Archaeological sites are further divided into two broad categories of culture, **prehistoric** (or Native American), and **historic** (or European-American). Different archaeological specialists are usually needed for prehistoric or historic sites because the nature of content and preservation and site locations are quite different.

Scope of Work

In responding to a project submission, the MHPC may issue a letter specifying which type of archaeological survey is needed (prehistoric, historic or both) and at what level (Phase I, II, or III). Often the response letter contains further information, such as the suspected presence of an historic site of a certain age, or a statement that only a portion of the project parcel in question is sensitive for prehistoric sites and only that portion needs archaeological survey.

Once the project applicant has one or more scopes of work (proposals) from appropriate archaeologists (see below), the applicant should submit their preferred proposal *(without attached financial information or bid total)* to the MHPC for approval. MHPC will not comment upon cost, but will comment on the appropriateness of the scale and scope of the work. An approval from MHPC of the scope of work is the applicant's guarantee that, if the field and laboratory work are done according to the scope, and appropriately described in writing, the results will be accepted by MHPC.

The final written report on the project must also be submitted to MHPC for review and comment.

Project Final Report

Whatever the archaeological survey result, a final report on the project should be submitted by the applicant to the MHPC. The MHPC will review the report, and issue further guidance or issue a "clearance" letter for the project.

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

KEI (Maine) Power Management (III) LLC — Lower Barker Hydroelectric Project (FERC No. 2808)

AMERICAN WHITEWATER'S COMMENTS AND STUDY REQUESTS IN RESPONSE TO THE NOTICE OF INTENT TO FILE LICENSE APPLICATION, FILING OF PRE-APPLICATION DOCUMENT (PAD), COMMENCEMENT OF PRE-FILING PROCESS, AND SCOPING: REQUEST FOR COMMENTS ON THE PAD AND SCOPING DOCUMENT, AND IDENTIFICATION OF ISSUES AND ASSOCIATED STUDY REQUESTS REGARDING THE LOWER BARKER HYDROELECTRIC PROJECT, FERC PROJECT NO. 2808

American Whitewater is a national non-profit 501(c)(3) river conservation and recreation organization founded in 1954. We have approximately 6,000 members and 100 affiliate clubs, representing tens of thousands of whitewater paddlers across the nation. American Whitewater's mission is to protect and restore our nation's whitewater resources and to enhance opportunities to enjoy them safely. Our members, who are primarily conservation-oriented kayakers and canoeists would enjoy this section of the Little Androscoggin.

The Little Androscoggin River flows through Auburn, Maine, where it has the potential ability to offer whitewater paddling opportunities below the Lower Barker Dam. Under the current mode of operation, the Licensee has eliminated any opportunity to enjoy this section of the river through the diversion of nearly all of the natural river flows through turbines for 0.54 river miles, severely impairing flows and eliminating recreational boating opportunities in a 2,850-foot-long section of the natural river. Other than minimum flows of as low as 20 cfs and flows below minimum generation, the Licensee's operation of the Lower Barker project diverts flows from the Little Androscoggin River, impairing fish habitat and reducing the recreational use and enjoyment of the river by boaters and other.

With appropriately timed flows of appropriate volume, this section of the river could be restored to a more natural state and become an asset to the community. This area also has the potential to foster economic development in the City of Auburn through the creation of a whitewater park. At whitewater parks across the country, boaters surf waves and perform a wide array of acrobatic tricks called "freestyle" paddling. Cities with whitewater parks also host freestyle and slalom competitions, drawing paddlers and spectators from around the region and the country.

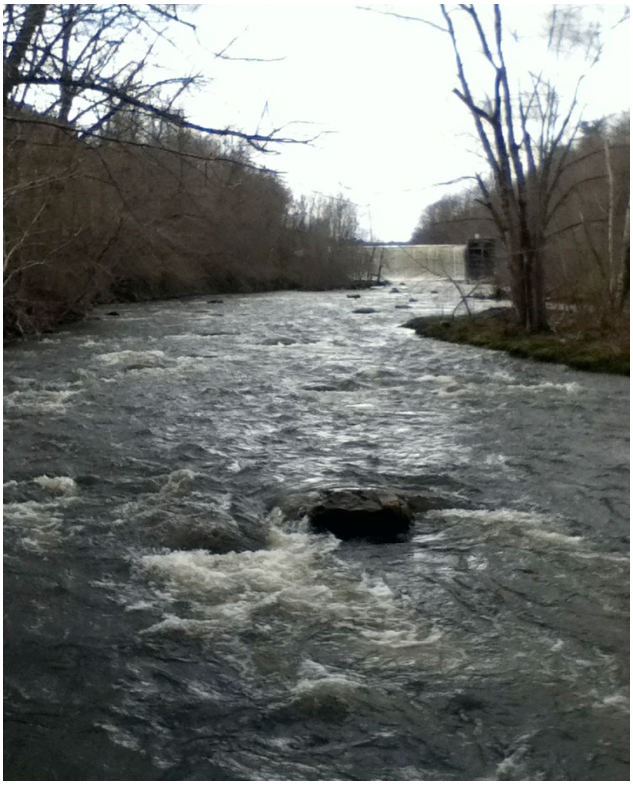
Issue #1: Whether Relicensing the Lower Barker Project is in the Public Interest

American Whitewater requests that FERC consider decommissioning the Lower Barker Hydroelectric Project as an alternative to relicensing. The Lower Barker Hydroelectric Project

has a damaging impact on river recreation, regional fisheries, and the ecological function of the river. These impacts include habitat fragmentation, blocking gravel and wood transport, and modification of the natural flow regime. In the case where licensing a project for hydropower is in the public interest, American Whitewater typically recommends specific measures that mitigate and enhance recreational opportunities. However, in the case such as this where continuing to operate the project for hydropower is not in the public interest, we support decommissioning the project and restoring the river and riparian landscape. Decommissioning the Lower Barker Dam would have a positive impact on the socioeconomic growth of the City of Auburn, create added recreation opportunities, and improve aesthetics. FERC should weigh the small value (1200 kW) of power generation at the Lower Barker Hydroelectric Project against the negative impact that the project is having on the public's use and access to the river in making a determination of whether relicensing of the project will be in the public interest.

Issue #2: Impacts of diverting the flow of the Little Androscoggin River on ecological and recreational values below the Lower Barker Dam.

The Lower Barker Hydroelectric Project reduces instream flows substantially, leaving only minimum flows or those flows required for fish passage by the U. S. Fish & Wildlife Service, National Marine Fisheries Service, or the Maine Department of Environmental Protection. Boatable flows under current operations are unpredictable, and are only available during periods when flows fall below 170 cfs or above 520 cfs. Some of the whitewater opportunities eliminated by the project could be provided in a moderate, stable, and predictable operational mode and occur during warm weather. The current operation of the project, and lack of access, virtually eliminates valuable summer paddling opportunities. In addition, we recognize that flow-related decisions also affect economic factors related to power generation and other environmental variables, particularly fish habitat and passage. In the PAD, the Licensee proposes no flow enhancement to mitigate the project's effects on whitewater recreational use. We believe that FERC should consider the potential for recreational boating below the Lower Barker Dam.



Natural River Channel Below the Lower Barker Dam

Issue # 3: Public Access for recreational boating in the natural river channel is inadequate.

There is currently no formal public access or parking owned by the Licensee for boaters. Presently, there is only limited access the natural river channel directly below the Lower Barker Dam. While the licensee is required to document recreational use at the project on FERC Form 80, it is impossible for the Licensee to do so in the absence of adequate public access to the river below the dam. Rather than provide access for recreational use of the river in the project boundary, the Licensee inappropriately seeks an exemption from FERC from its obligation to file FERC Form 80. In the PAD, the Licensee proposes no new river access areas. We believe that FERC should require the Licensee to develop a plan for improved public access to the natural river channel below the Lower Barker Dam.

Issue #4: Economic impacts.

The Licensee's operation of the Lower Barker Dam has significant negative recreational impacts and related socio-economic impacts. By changing the operational scenario of the Lower Barker Hydroelectric Project, the potential exists to create new tourism products for a region. Other communities that have developed whitewater boating opportunities have experienced economic benefits that far outweigh the value of power generation. Visitors to the area will discover added value to the region that could be derived from the development of a whitewater park in Auburn.

In making a public interest decision, FERC must weigh the value of water in the river against the value of diverting flows for power generation, and then reach a comprehensive plan for the development of the river that strikes the appropriate balance and is best adapted to the river. In many dam relicensing proceedings, the values of flow restoration are largely recreational and ecological, and thus hard to evaluate in dollars. In this case, because of its potential to increase recreation with scheduled flows, we believe FERC should also weigh the predicted economic value associated with the recreational use when looking at various alternatives.

Issue #5: Mitigation for Loss of Whitewater Recreation at Great Falls and Upstream

The Lower Barker Dam has eliminated what would otherwise be a significant whitewater boating opportunity, both above and below the dam, and an economic benefit for the local community. It would be possible to compensate for this loss through either on-site or through off-site mitigation by supporting conservation and recreation stewardship in the region.

<u>Study Requests</u>

We hereby request several studies per 18 CFR 5.9(b).

1. Controlled Whitewater Flow Study in the bypass reach below Lower Barker Dam.

(1) Describe the goals and objectives of each study proposal and the information to be

obtained.

The goals of a whitewater flow study are as follows:

1. To assess the presence, quality, access needs, flow information needs, and preferred flow ranges for river-based boating resources in a stepwise manner.
2. To identify and define adequate access points that provide parking for boating and pedestrian access to the natural river channel bypassed by the Licensee's flow diversion.
3. To examine the regional economic benefits of various flow alternatives that can be provided by restoring natural flows to the Little Androscoggin River.
4. To determine the value of recreation opportunities lost as a result of the Licensee's operation of the Project.
5. To determine the suitability of the reach for the development of a whitewater park.

(2) If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resource to be studied.

The requester is not a resource agency.

(3) If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.

The Lower Barker natural river reach has the potential to offer a whitewater boating resource when flow conditions are suitable. Conducting the necessary studies and implementing measures to ensure public access to outdoor recreation is in the public interest. It is widely accepted that outdoor recreation has significant benefits to participants including health, well being, and quality-of-life. Outdoor recreation also has proven economic benefits for communities located near recreational resources.

FERC must decide whether to issue a license to KEI (Maine) for the Lower Barker Hydroelectric Project. Sections 4(e) and 10(a) of the Federal Power Act require the Commission to give equal consideration to all uses of the waterway on which a project is located, and what conditions should be placed on any license that may be issued. In making its license decision, the Commission must equally consider the environmental, recreational, fish and wildlife, and other non-developmental values of the project, as well as power and developmental values. Any license issued shall be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. Recreation has been identified as a legitimate project purpose by the Commission. Identifying effects of project operations pertaining to this resource is relevant to the Commission's public interest determination.

(4) Describe existing information concerning the subject of the study proposal, and need for additional information.

While many flow studies have been conducted during FERC relicensings on New England's rivers that have a long history of whitewater paddling use, this section of the Little Androscoggin

River is largely unknown to whitewater boaters largely due to the lack of adequate access and unpredictable flows. With proper study, planning and flows, there is the potential for creating a high quality run on the Little Androscoggin from the Lower Barker Dam to its confluence with the Androscoggin downstream from the tail race. In addition, the Town of Auburn is exploring the potential for creating a whitewater park in this section of the river.

Current and historic project operations, however, have resulted in significant information gaps and virtually eliminate all stable low and moderate flows from this reach, and the lack of adequate access has eliminated nearly all recreational use. The study will determine whether there are additional opportunities for recreational use through a modification of the Licensee's mode of operation and improved access.

Given that the Licensee has sought an exemption from the requirement that it prepare a FERC Form 80 Recreation Use Report and that its current mode of operation and lack of access to the natural river reach make recreational use nearly impossible, further study is a necessary part of this relicensing proceeding. Furthermore, the PAD contains no information on the potential for recreational boating below the Lower Barker Dam or the potential for developing a whitewater park in the project boundary. The Licensee does not propose to study whether there would be future recreation demand if the Licensee provided better access, changed its mode of operation, or supported the development of recreational enhancements.

(5) Explain any nexus between Project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.

The Project controls flows in the Little Androscoggin River by withdrawing up to 500 cfs for generational flows, diverting as much as 95 percent of the natural flows, leaving as little as 20 cfs in the river. The remaining flows are insufficient to support recreational boating, and the unpredictability of the flows and the inadequate access prevents virtually all recreational use. The results of a controlled flow study would help determine the need for license requirements for scheduled water releases into the natural river channel that would allow recreational use and promote a healthier aquatic habitat.

(6) Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.

The study we request on the reach below the Lower Barker Dam on the Little Androscoggin River should follow the standard methodology as described in Whittaker et al., in "*Flows and Recreation: A guide to studies for river professionals"* (2005), as we formally request below. This study would examine:

- The range of optimal and acceptable flows for whitewater paddling;

- The frequency, timing, duration and predictability of optimal and acceptable paddling flows under current conditions in the bypass reach, and how proposed alternative operations could be used;
- The access needs of whitewater boaters and the current and potential river access option for whitewater and other paddling;
- The flow information needs of whitewater boating and the current and potential flow information distribution system;
- The location, challenge, and other recreational attributes associated with river features.

This methodology is designed to gather information to assess the presence, quality, and preferred flow ranges for river-based boating resources in a step-wise manner. Because the quality of the resource and flow needs are not known, we request an on-water multiple flow assessment be conducted. We will work with the Licensee to document the known information regarding the river. We will provide volunteers and technical support for the studies as appropriate. We hope to work collaboratively with the Licensee on this study. The whitewater boating study methodology we have requested has been used on dozens of other FERC regulated reaches. In addition, the licensee should retain qualified experts who can assess the suitability of this reach for the development of a whitewater park, and perform such other work as is necessary to assure adequate access to this section of the river.

(7) Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

We are willing to work with the Licensee on the whitewater paddling controlled-flow study to keep costs reasonable and the quality of information high. The Licensee will need to prepare a flow study report documenting the flows paddled by boaters, with still image and video documentation, surveys of the boaters, a guided conversation among the boaters, and subsequently a written report. Given the collaborative approach sought by the paddling community, including in-kind contributions of time and expertise, a consultant should be able to complete this study on behalf of the Licensee for a very reasonable cost. The estimated cost of the whitewater boating flow assessment is approximately $30,000, depending upon the extent of fieldwork conducted.

Conclusion:

We respectively request the hydrological, recreational, economic studies, and off-site mitigation that will support the dialog and analysis regarding restoring flows and the associated recreational values to the Lower Barker Project. Thank you for considering these comments and study requests.

Respectfully submitted this 3rd day of July, 2014

Bob Nasdor
Northeast Stewardship Director
American Whitewater
65 Blueberry Hill Lane
Sudbury, MA 01776

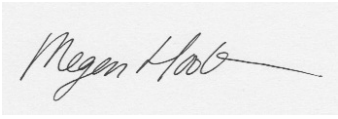
UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

KEI (Maine) Power Management (III) LLC **Lower Barker Hydroelectric Project**	**Project No. 2808**

CERTIFICATE OF SERVICE

Pursuant to Rule 2010 of the Commission's Rules of Practice and Procedure, I hereby certify that I have this day caused the foregoing **American Whitewater's Comments and Study Requests in Response to the Notice of Intent to File License Application, Filing of Pre-Application Document (PAD), Commencement of Pre-Filing Process and Scoping for the Lower Barker Hydroelectric Project, FERC No. 2808** to be served upon each person designated on the official service list compiled by the Secretary in this proceeding.

Dated this 3rd day of July, 2014.



Megan Hooker
American Whitewater

City of Auburn, Maine

Office of the City Manager

June 24, 2014

VIA E-FILING

Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

RE: Comments on the Lower Barker Hydroelectric Project (FERC No. 2808) PAD

Dear Secretary Bose:

On January 31, 2014, KEI (Maine) Power Management (III) LLC [KEI (Maine)] filed the Pre-Application Document (PAD) for the Lower Barker Hydroelectric Project (FERC No. 2808) with the Commission. On March 19, 2014 the Commission granted the use of the Traditional Licensing Process (TLP) for the Lower Barker Project. Based on our review of the PAD, the City of Auburn, Maine offers the following comments.

3.2 MAJOR LAND USES

The Lower Barker Project is located wholly within the city of Auburn, which is comprised of a mix of urban development and forested areas. Auburn was incorporated as a town in 1842. In the mid-1850s Auburn emerged as a "powerful and well-organized city" (Men, 1889), noted for its multitude of mills and factories (FERC, 1996). Today, many of the mills and factories are defunct and the areas of Auburn closest to the Project are zoned as general business; multifamily urban and suburban; and rural residential (Auburn, 2011).

Local response:

It should be noted that Auburn adopted a new Comprehensive Plan, Auburn Tomorrow and a New Auburn Master Plan in April of 2011and the plan calls for changes to zoning in the project area from General Business and residential zones to Resource Protection on parcels that are partially or wholly located within the 100 year floodplain as mapped by FEMA. The change will protect flood prone areas from development and property damage as well is increase opportunities for preservation or open space and public access. The New Auburn Master Plan outlines the need to establish a riverfront open space district to promote development of a greenbelt along the Androscoggin and Little Androscoggin Rivers with trails, parks and public access points (pg 11.)The plan further identifies Recreation Objective 1 as: Establish a greenbelt and increase riverfront access (Pg23).

4.3 PROJECT BOUNDARY

The project boundary encompasses the impoundment up to the normal full pond elevation 165.7 feet NAVD88 and extending upstream to the base of the Upper Barker Dam. The project boundary also encloses the dam, bypass reach, buried penstock, and the powerhouse. There are no proposed changes to the project boundary for the Lower Barker Project.

Local response:

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(207) 333-6601 ext. 1216 • (207) 333-6621 Fax
jlabonte@auburnmaine.gov
www.auburnmaine.gov

The section above incorrectly notes the project boundary as being the full pond elevation of 165.7 feet NAVD88 when the applicant has confirmed that the boundary is actually proposed at 166.7 feet NAVD88. The FEMA Flood Insurance Rate Map for Androscoggin County, panel 328 of 470, Effective July 8, 2013 shows an increased flood elevation, as compared to the previous Flood Insurance Rate Map for Androscoggin County, City of Auburn, CP230001 0008C, within the project boundary and the associated expansion of flood boundaries. It is recognized that part of the difference is attributed to the conversion from NGVD 29 to NAVD 88, however, the project has a direct influence on the 100-year flood elevation and we request that the applicant consider revising the project boundary elevation in their application to match the FEMA maps at approximately 172 feet NAVD88.

4.6.1 CURRENT LICENSE REQUIREMENTS

Article 23 requires the Licensee to install and maintain safety devices to alert the public of changes in flow from the Project, and to protect recreational users at the Project.

Local response:

We have found that fisherman and boaters on the river use USGS gauge data when deciding to recreate on the river. As the community has clearly identified the desire to increase access and recreational use as a quality of life enhancement and an economic benefit to the community it would be useful to also have the applicant publish daily flows on their website or some other accessible location so local users and users from away can access the information remotely. This will aid in safety and decision making for when to make a recreational trip to the Little Androscoggin River. USGS Station 01057000 in South Paris, ME is the nearest gauge site and does not accurately reflect conditions within the project boundaries.

5.7.3 EXISTING PROJECT RECREATION OPPORTUNITIES AND USE

KEI (Maine) permits public use of the project land and waters for recreation, however there are no formal recreation facilities within the project boundary. KEI (Maine) seasonally implements a boat barrier in the impoundment above the dam, installing it from May 31 through October 12.

The Barker Mill Trail provides shoreline access to the impoundment and an informal hand-carry boat launch and an informal trail provides access to the bypass reach immediately downstream of the dam. There is no formal portage route at the Project, but paddlers can traverse the dam via an informal 0.3 mile portage route (egress from the impoundment at the Barker Mill Trail to Mill Street to Second Street to ingress downstream at the Little Andy Park boat launch). KEI (Maine) has limited ownership of the lands surrounding the Project. The lands surrounding the Project structures are densely forested with a steep and rocky ravine leading down to the water. (5-52)

Local response:

With no signage or maintenance program, there is no informal or formal involvement of KEI with the recreational access provided via the Barker Mill Trail. The Androscoggin Land Trust (ALT), as part of its support to implement the New Auburn neighborhood master plan, engaged directly with the owners of that land, the Frank family, to secure a right for public access via a legal document signed between ALT and the Franks. In addition, no known paddling access, hand-carry, portage, etc has been known to exist in our around this project facility, the by-pass reach, or the Upper Barker Dam.

5.7.3 EXISTING PROJECT RECREATION OPPORTUNITIES AND USE

"According to an Environmental Inspection Report conducted by FERC on September 15, 2009, there is "little potential for recreational opportunities" (FERC, 2011) at the project site.

Recreation activities at the Project are very limited, primarily consisting of shoreline fishing. According to a FERC Form 80, Licensed Hydropower Development Recreation Report, filed in 2003 there were 193 visitors to the site between the months of April and October (Ridgewood, 2003). Monitoring for a subsequent Form 80 took place from April through October of 2010. During that time there were 25 total visitors observed, resulting in an estimated 50 recreation days associated with the Project. (5-53)"

Local Response:

ALT has repeatedly attempted over the last five years to speak with the licensee about recreational access around the Project Area given the known local demand, documented by calls and letters to ALT as well as information gathered during public planning processes. ALT's calls and e-mails were either never responded to or assurance was given that responses would be forthcoming only to never have that happen.

Given the lack of engagement by the licensee, ALT and partners with the City of Auburn and other agencies, including the National Park Service, set out to plan for improved access along and on the Little Androscoggin River as well as beginning to identify niche recreational opportunities that could support growing economic opportunity for the neighborhood.

As part of this effort, ALT began supporting regular recreational programs to introduce neighbors and visitors to the Little Androscoggin for paddling and walking/hiking. These efforts have led to hundreds of youth per year taking fishing trips to the Project Area, hundreds of paddlers during community festivals and countless others taking to the river, and thousands of hikers and walkers from the Barker Mill, local businesses and their wellness efforts and local residents taking to the Barker Mill Trail to experience the outdoors in their backyard.

This data, though not following the prescription of the Form 80 process for lack of responsiveness from the licensee, shows there is demand and that the demand is not being met and improvements could and should be made to support that demand and enhance experiences.

"5.7.4 RECREATION NEEDS IDENTIFIED IN MANAGEMENT PLANS

New Auburn Master Plan

The New Auburn Master Plan is a comprehensive plan specifically for the village of New Auburn located within the City of Auburn. The Master Plan identifies strategies to address current issues in the village, and identifies goals for the future of New Auburn. The plan does not specifically address recreation activities at the Lower Barker Project. Among the recreation goals of the 2010 Update that may bear relevance to the Project are (New Auburn, 2009):

- *To increase public access to the Little Androscoggin and Androscoggin rivers.*
- *To protect undeveloped areas, and support the protection of natural resources*
- *To create a greenbelt of connected trails around the neighborhoods of In Town and Uptown.*
- *To support trail connectivity by creating a pedestrian bridge across the Little Androscoggin River at the Barker Mill Trail.*
- *To support organizations in their efforts to develop recreational opportunities on the river including boat launches. (5-55)"*

Local Response

The New Auburn Master Plan, which is part of the adopted Comprehensive Plan for the City of Auburn, clearly identified needed improvements in the area of the Lower Barker Project, including improved water access to the river and access along the shores. ALT advised the consultant team for the licensee that a land and water trail study for the area was completed under grant funding and could be shared to provide additional details, the consultant never followed up to review before completing the Pre-Application Document (PAD).

The lack of access to the Little Androscoggin River is seen as a major concern, and water levels near Little Andy Park make paddling access difficult if not impossible during the summer and fall season. This challenge has been documented in past studies. The New Auburn Master Plan outlines the need to establish a riverfront open space district to promote development of a greenbelt along the Androscoggin and Little Androscoggin Rivers with trails, parks and public access points (pg 11.)The plan further identifies Recreation Objective 1 as: Establish a greenbelt and increase riverfront access (Pg23).

Lastly, it was made known to the consultant that a major economic development/land use study for the New Auburn village area was underway, as the City is committed to improving the economic outlook for the neighborhood and its residents, given the high rates of poverty and low property values concentrated in this area. Access to the river, visually and for recreation, have been central to that planning effort.

"5.8.1 VISUAL CHARACTER OF THE PROJECT VICINITY

A paved public road runs parallel to the project area, therefore making the project area visible for most public travel. The Barker Mill Trail is a walking trail developed by the ALT. This trail runs parallel to the Little Androscoggin River starting upstream of the Project at the Upper Barker dam and ending at the driveway to the Project. The Trail provides views of the project areas and facilities for pedestrians. (5-63)"

Local Response

While there is reference to a paved public road, and assuming that is Mill Street, it should be stated that the topography of the Project Area does not afford travelers views to the river or the project area along the river. Both forested land and the steep terrain serve to block views down to the river. This unique topography does create a remote feeling for those walking along the ALT developed trail in the Project Area, as we sought to

meet the neighborhoods interest in such an experience proactively without previous response from the licensee.

"5.8.3 VISUAL CHARACTER OF PROJECT LANDS AND WATERS

A public road runs parallel to the project area. During winter months the project area is highly visible from this road, however the foliage fills in during fall and summer months obscuring views of the Project (Photo 5.8-2). (5-64)"

Local Response

The Project Area is only highly visible from the road if a driver were to stop their vehicle in the road and look directly to their right or left. The photo included by the consultant for the licensee was actually taken approaching a very sharp turn in the road. Drivers would not be able to see the project area in this one, small section where it is visible, unless they were choosing to drive unsafely and could possibly cause a major accident, given the narrow roadway and steep drop off to the river over the guard rail.

"5.10.3 HOUSEHOLDS/FAMILY DISTRIBUTION AND INCOME

In 2011, the annual per capita personal income for Androscoggin County was $23,663, slightly below the state of Maine per capita personal income of $26,195. In 2011, Androscoggin County had 43,968 household and an average household size of approximately 2.4 individuals. From 2007-2011, the County had a higher percent of persons below poverty level than the state average, 14.2% and 12.8% respectively. (U.S. Census 2012a).

Auburn residents had an annual per capita income of $25,279 in 2011, comparable to the overall average for the state of Maine. The city of Auburn had 11,016 households and an average household size of approximately 2.2 individuals in 2011. The percentage of persons below poverty level in the city from 2007-2011 was approximately equal to the poverty rate for Androscoggin County at 14.3% (U.S. Census 2012b). Approximately 87% of the population of Androscoggin County had an education attainment of high school graduate or higher, while 19% held Bachelor's degrees or higher (U.S. Census 2012a). Approximately 89% of the population of Auburn had an education attainment of high school graduate or higher, while 26% held Bachelor's degrees or higher (U.S. Census 2012b). (5-72)"

Local Response

While the licensee's consultant did highlight the demographics of Androscoggin County and Auburn, specifically, they should have uncovered that the neighborhoods surrounding the Project Area have been identified as Target Areas under the US Department of Housing and Urban Development Community Development Block Grant program. These neighborhoods, Downtown and New Auburn, have among the highest rates of poverty and blight in the city, as the city attempts to breathe new economic life into them through targeted programs and incentives to investors, including priorities around connecting to and using the Little Androscoggin River.

"6.1.6 RECREATION AND LAND USE

The City of Auburn expressed that the lands along the Little Androscoggin River are important

to the City and its long-range plans for recreational access to the river. At the December 17, 2013 meeting, the City of Auburn and the Auburn Land Trust indicated a desire for impoundment and bypass reach access, requested documentation of recreation resources in the vicinity of the

Project, and reiterated the importance of the river as a public recreational resource. The Project occupies a relatively small footprint and is surrounded by privately owned lands. KEI (Maine), as required by the license, allows free public access to project lands and waters for recreation. A hand-carry boat launch is located on the impoundment off of the Barker Mill Trail. Bypass reach access for angling is also available from a short trail off of Mill Street. The ability of KEI (Maine) to enhance recreation at the Project is hindered by the lack of space, available land, and the precipitous nature of the bypass reach shoreline. Nevertheless, KEI (Maine) understands recreational access is an important issue to stakeholders and will work with them to address concerns through the relicensing process. (6-3)"

Local Response

As a clarification, the name Auburn Land Trust should read Androscoggin Land Trust.

To the knowledge of ALT and the City, a hand carry access and portage trail does not exist in this Project Area and previous requests to the licensee to document project recreational facilities have not been responded to. The recreational access that exists to this point has been provided through partnerships between ALT and private landowners. The Barker Mill Trail was impassable from the Gatehouse south due to vegetation overgrowth and fallen trees. It was the work of ALT and partners at the National Guard that allowed the trail and access to the impoundment to be available to the public. Enhanced access and

recreational amenities in the impoundment and by-pass reach are essential and could be achieved with licensee investment and partnerships with private landowners, as ALT has now modeled as possible. Given the importance of recreation to neighborhood economic development plans and the proposed new land-uses, recreational studies should be undertaken to assess, in addition to access points, what flows provide what type of recreational access within the by-pass reach, including consistent flat-water paddling and opportunities to take advantage of grades to introduce limited play-whitewater as part of economic attraction for the neighborhood.

"6.1.7 AESTHETIC RESOURCES

The Project is visible from various vantage points along Mill Street and Main Street. The Project is in keeping with the industrial architecture of the redeveloped mill buildings in the immediate vicinity. No effects to aesthetic resources are expected from continued project operations. (6-3)"

Local Response

Studying means to enhance visual access to the Project Area should be included.

"6.1.9 SOCIOECONOMIC RESOURCES

The Project has limited socioeconomic influence over the immediate area, the City of Auburn. The plant is remotely operated and does not significantly contribute to business or industry in the City. (6-3)"

Local Response:

As has been highlighted in other responses, the development of recreational access and enhancements in the Project Area are seen as a critical asset for neighborhood redevelopment and securing investment to improve quality of life and the economic status of residents and families in this area.

Sincerely,

Clinton Deschene

Clinton Deschene
City Manager

City of Auburn, Maine

Office of the City Manager

June 24, 2014

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington D.C. 20426

RE: Study Request, Lower Barker Hydroelectric (FERC No. 2808), KEI (Maine) Power Management (III)

Dear Secretary Bose:

On January 31, 2014, KEI (Maine) Power Management (III) LLC [KEI (Maine)] filed the Pre-Application Document (PAD) for the Lower Barker Hydroelectric Project (FERC No. 2808) with the Commission. On March 19, 2014 the Commission granted the use of the Traditional Licensing Process (TLP) for the Lower Barker Project. The City of Auburn, Maine is also filing separate comments on the PAD.

This filing contains The City of Auburn's formal study request based on the PAD and 5/19/14 consultation meeting.

The City requests that the applicant complete a recreational study including the development of additional recreational access, identification of niche recreational opportunities that could support growing economic opportunity for the neighborhood and white water potential consistent with the American Whitewater request for this study. The Form -80 recreational survey that is in progress is inadequate to consider the needs of the community and demand for additional facilities. As noted in the comments also submitted by the City of Auburn recreational access to the Little Androscoggin River is a high community priority.
The PAD identifies a year-round minimum flow of 20 cfs as an existing license requirement within the lengthy bypass channel which extends approximately ½ mile to the confluence with the tailrace. The river extends an additional ¼ mile beyond the tailrace to the confluence with the Androscoggin River. During the 5/19/14 consultation meeting a KEI representative indicated that the actual total year round minimum flow maintained in the bypass is approximately 30 CFS. A site walk by City staff on June 10, 2014 revealed that the flows in the bypass reach were not adequate to support migratory Aelwives and fish were becoming stranded on the rocks in the bypass reach. Photos and video are available if requested. It is unclear if minimum flows were followed on that day or if the

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minimum flows are inadequate to support fish passage but the City of Auburn supports the Maine IF&W request for a flow study and for improved fish passage at the facility. It should also be noted that fish passage facilities are being improved between this facility and the Atlantic Ocean and similar improvements should be studied at this facility.

In addition the City requests a study of public and private benefits associated with the dam and the facility's limited generating capacity. The Dam splits a roughly 6800' section of the Little Androscoggin River between the Upper Barker Mill Dam and the confluence with the Androscoggin River into two segments. If fish passage, recreational facilities and additional minimum flows are required to mitigate the negative impacts of the facility, then we currently lack the information to consider if decommissioning of the Lower Barker Mill Dam would be in the best interest of all parties involved.

The City further requests that the project area include all lands below the FEMA mapped 1% flood hazard area as adopted on July 8, 2013.

Thank you in advance for your consideration of our requests. Recreational opportunities in our community are a top priority as indicated in our PAD comments document.

Sincerely,

Clinton Deschene

Clinton Deschene
City Manager

Document Content(s)

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PAUL R. LEPAGE
GOVERNOR

PATRICIA W. AHO
COMMISSIONER

July 16, 2014

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Subject: FERC 2808, Lower Barker Hydroelectric Pre-Application Document Comments

Dear Secretary Bose:

The Maine Department of Environmental Protection (Department) received and reviewed a Notice of Intent (NOI) to File License, dated March 19, 2014, and Pre-Application Document (PAD), dated January 31, 2014, for the existing Lower Barker Hydroelectric Project (Lower Barker Project), FERC number 2808. Department staff attended a Joint Agency Meeting and a site visit on May 19, 2014, and reviewed appropriate project documents to prepare the following comments and recommendations.

The proposed relicensing is subject to Water Quality Certification provision of Section 401 of the Federal Water Pollution Control Act (a.k.a Clean Water Act). By Executive Order of the governor of the State of Maine, the Maine Department of Environmental Protection is the State certifying agency for projects located wholly or in part in organized towns and cities, and is the State certifying agency for all water quality certifications. Therefore, the Department has jurisdiction over the Lower Barker Project. KEI (Maine) Power Management (III) LLC intends to use the Traditional Licensing Process (TLP) in support of this relicensing.

The Lower Barker Project is located on the Little Androscoggin River in Androscoggin County, Maine, within the town of Auburn, and consists of a 232-foot-long, 30-foot-high concrete Ambursen pier and buttress dam with a 125-foot-long spillway, including a 46-foot-long non-overflow stoplog with waste gates measuring 8-feet-high by 10-feet-wide and a 61-foot long non-overflow with six 7-foot wide by 5-foot high stop-log sections and one 4-foot wide by 5-foot high stop-log section. With 14-inch flashboards in place, the normal full pond water surface elevation is 164.7 feet NAVD88. The discharge capacity of the spillway is 12,600 cfs. The project also contains a 14.8-foot-wide power canal, intake and gate house; a 780-foot-long underground concrete penstock; a transformer and substation; and a powerhouse containing one horizontal tube turbine and generator unit with a capacity of 1,200KW at 46 feet of head. The unit has a maximum hydraulic capacity of 500 cfs and a minimum hydraulic capacity of 150 cfs.

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17 STATE HOUSE STATION
AUGUSTA, MAINE 04333-0017
(207) 287-7688 FAX: (207) 287-7826

BANGOR
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PORTLAND
312 CANCO ROAD
PORTLAND, MAINE 04103
(207) 822-6300 FAX: (207) 822-6303

PRESQUE ISLE
1235 CENTRAL DRIVE, SKYWAY PARK
PRESQUE ISLE, MAINE 04769
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web site: www.maine.gov/dep

The Department understands that at this time there are no proposed changes in facilities or operation of the Lower Barker Project.

Comments on PAD

The Department appreciates the effort of KEI (Maine) Power Management (III) LLC and their consultants to prepare a Pre-Application Document. The PAD provides a good understanding of the project, the surrounding resources and dam operation. The PAD provides the agencies information from which issues related to dam relicensing can be readily identified.

It should be noted that if changes are proposed to the run-of-river operational mode, additional studies may be required to establish conformance with State Water Quality Standards.

Water Quality Classifications and Standards

Water Quality Standards and the water quality classifications of all surface water of the State have been established by Maine Legislature (Title 38 M.R.S.A. §§ 464-467). The following classifications apply to the waters affected by the Lower Barker Project:

Little Androscoggin River, main stem.

(b) From the Maine Central Railroad bridge in South Paris to its confluence with the Androscoggin River-Class C.

Class C waters must be of such quality that they are suitable for the designated uses of drinking water supply after treatment; fishing; agriculture; recreation in and on the water; industrial processes and cooling water supply; hydroelectric power generation except as prohibited under Title 12, section 403; navigation; and as habitat for fish and other aquatic life.

The dissolved oxygen content of Class C waters shall be not less than 5 parts per million or 60% of saturation, whichever is higher, except that in identified salmonid spawning area where water quality is sufficient to ensure spawning, egg incubation and survival of early life stages, that water quality sufficient for these purposes must be maintained. In order to provide additional protection for the growth of indigenous fish, the following standards apply.

(1) The 30-day average dissolved oxygen criterion of a class C water is 6.5 parts per million using a temperature of 22 degrees centigrade or the ambient temperature of the water body, whichever is less, if:
   (a) A license or water quality certificate other than a general permit was issued prior to March 16, 2004 for the Class C water and was not based on a 6.5 parts per million 30-day average dissolved oxygen criterion; or
   (b) A discharge or a hydropower project was in existence on March 16, 2005 and required by did not have a license or water quality certificate other than a general permit for the Class C water.

   This criterion for the water body applies to the licenses and water quality certificates issued on or after March 16, 2004.

(2) In Class C waters not governed by subparagraph (1), dissolved oxygen may not be less than 6.5 parts per million as a 30-day average based upon a temperature of 24 degrees centigrade or the ambient temperature of the water body, whichever is less. This criterion of the water body applies to licenses and water quality certificates issued on or after March 16, 2004.

The Department may negotiate and enter into agreements with licensees and water quality certificate holders in order to provide further protection for the growth of indigenous fish. Agreements entered into under this paragraph are enforceable as Department orders according to the provisions of sections 347-A to 349.

Between May 15th and September 30th, the number of Escherichia coli bacteria of human and domestic animal origin in Class C waters may not exceed a geometric mean of 126 per 100 milliliters or an instantaneous level of 236 per 100 milliliters.

Discharges to Class C waters may cause some changes to aquatic life, except that the receiving waters must be of sufficient quality to support all species of fish indigenous to the receiving waters and maintain the structure and function of the resident biological community.

Anti-degradation

The State's anti-degradation policy provides that water quality certification may be approved only if the applicable standards of classification of the affected water body are met, and existing in-stream uses and the level of water quality necessary to protect those existing uses are maintained and protected. The policy also provides that, where the actual quality of any classified water exceeds the minimum standards of the next highest classification, that higher water quality shall be maintained and protected.

Water Quality Certification Data Requirements

In Section 6.2.2 Water Resources, KEI (Maine) indicated its expectation of conducting water quality studies in cooperation with Maine Department of Environmental Protection. It has been the Department's practice to determine specific metrics, methods, timing and duration of water quality monitoring necessary to ensure that the water quality studies meets data quality objectives. The Department requests that KEI (Maine) Power Management (III) LLC design the water quality studies to include the following parameters and following the Department's established sampling protocols in support of water quality certification.

1) **Effects of an impoundment on the designated use 'recreation in and on the water' (swimming and other water contact recreation)**

   In order to meet the designated use 'recreation in and on the water', Class GPA waters (lakes and ponds) must have a stable or decreasing trophic state, subject only to natural fluctuations and must be free of culturally induced algal blooms that impair their use and enjoyment. 38 MRSA §465-A. Rivers and streams (including impoundments classified

as such) must also be free of culturally induced algal blooms that impair their use and enjoyment. An algal bloom is defined as a planktonic growth of algae which causes Secchi disk transparency to be less than 2.0 meters or excessive chlorophyll-a concentrations. 06-096 CMR 581. Impoundments can create quiescent lake-like conditions conducive to growth of nuisance algal blooms, given excess nutrients from watershed sources. Studies of Trophic State are required for lakes, ponds, and impoundments affected by hydropower projects to determine if the projects cause non-attainment of the designated use, 'recreation in and on the water'. The Trophic State Study for Lower Barker should follow the SAMPLING PROTOCOL FOR HYDROPOWER STUDIES-RIVERS.

2) Effect of a project on the designated use 'habitat and aquatic life criteria'

To meet the designated use 'habitat for fish and other aquatic life' and aquatic life criteria in anti-degradation statements, existing hydropower impoundments classified as Great Ponds or as rivers and streams and downstream river and stream reaches affected by hydropower projects are required to meet only the requirements of Class C waters, i.e., "maintain structure and function of the resident biological community. 38 MRSA § 464 (9) and (10); 38 MRSA § 465 (4) (C). The Department has a long-standing rebuttable presumption that 'structure and function' will be maintained in a lake, pond or impoundment if at least 75% of the littoral zone is wet at all times, unless data specific to the waterbody demonstrates otherwise. The Department also has a long-standing rebuttable presumption that for 'structure and function' to be maintained in a free-flowing river or stream, at least 75% of cross section of the river must be wet at all times. In addition the macroinvertebrate community must attain structure and function as determined by Department Rule, *Classification Attainment Evaluation Using Biological Criteria for Rivers and Streams*. 06-096 CMR 579. Trophic State studies are required to provide necessary information for use in calculating the amount of habitat left after dewatering of the littoral zone of lakes, ponds, and impoundments. River Cross-Section Flow studies are required to provide information for use in calculating the amount of habitat in rivers and streams. The Habitat and Aquatic Life Criteria Study for Lower Barker should follow the *Methods for Biological Sampling and Analysis of Maine's Rivers and Streams*, and will incorporate data from the Trophic State study.

3) Effects of the project on dissolved oxygen criteria

Dissolved oxygen (DO) depressions within lakes, ponds and riverine impoundments are a function of degradable organic material, retention time, and/or lack of mixing that may be caused by effect of a dam on mixing due to depth, topography, bathymetry or thermal stratification. As a result DO concentrations may fall below the statutory criteria in those impoundments classified as rivers or streams. In addition, low dissolved oxygenated water generated in lakes, ponds, and riverine impoundments, particularly in the deeper waters, can be transferred to the river or stream below the dam by deep withdrawals for generation, violating DO criteria there as well. Repeated temperature and DO depth

profiles in lakes, ponds, and riverine impoundments, and single depth measurements in rivers and streams, are required to ensure that hydropower projects do not cause non-attainment of the DO criteria on either side of the dam. The Dissolved Oxygen Study for Lower Barker should follow the SAMPLING PROTOCOL FOR HYDROPOWER STUDIES-RIVERS.

4) **Effect of drawdown on designated use of 'fishing'**

The designated use of 'fishing' requires that not only are fish populations healthy and sustainable, but that the fish are safe to eat in unlimited quantities. Existence of a Fish Consumption Advisory recommending limited consumption constitutes non-attainment of the designated use. Maine has a statewide Fish Consumption Advisory for all freshwaters due to elevated levels of mercury from atmospheric deposition. Lakes or impoundments with large (~>10 feet) water level drawdowns can result in elevated mercury content of fish that may require a more stringent Fish Consumption Advisory, and therefore contribute to non-attainment of the designated use. Lower Barker Hydroelectric project operates in run-of-river mode, where impoundment water level drawdowns do not exceed ten feet. Therefore, the hydropower project operational drawdown will not contribute to non-attainment of the designated use of fishing and study of the effects of drawdown on fish is not required for this project.

To ensure that a hydropower project addresses these issues and does not cause or contribute to non-attainment of Maine's Water Quality Standards, data should be collected in accordance with the Department's Division of Environmental Assessment Hydropower Sampling Protocol and Bio-monitoring Protocol; a copy of each sampling protocol is attached.

In addition to meeting requirements of the Water Quality Certification process, the Department supports study requests prepared by other natural resource agencies, including but not limited to, Maine Department of Marine Resources (MDMR) and the National Marine Fisheries Service (NMFS).

Thank you for the opportunity to comment on the Pre-Application Document for the Lower Barker project. If you have any questions, please contact me by phone at (207) 446-2642 or by email at Kathy.Howatt@maine.gov .

Sincerely,

Kathy Howatt

Kathy Davis Howatt
Hydropower Coordinator, DLRR
Maine Department of Environmental Protection

Encl: DEP Sampling Protocol for Hydropower Studies

Lakes, Ponds and Impoundments (June 2014)

DEP Methods for Biological Sampling and Analysis of Maine's Rivers and Streams (August 2002)

Cc: Lewis Loon, KEI (Maine) Power Management (III) LLC (email)
Oliver Cox, MDMR (email)
John Perry, MDIFW (email)
Antonio Bentivoglio, USFWS (email)
Sean McDermott, NOAA (email)

DEP SAMPLING PROTOCOL FOR HYDROPOWER STUDIES June 2014

LAKES, PONDS, AND IMPOUNDMENTS

Trophic State Study

Sampling personnel must be certified annually for this sampling protocol by DEP's Division of Environmental Assessment Lakes Section.

Each basin shall be sampled at the deepest location twice each month for at least five consecutive months during one open water season as follows.

Parameter	Sampling method	Detection limits
Secchi disk transparency	water scope	0.1 meter
Temperature	profile*	0.1 C
Dissolved oxygen	profile*	0.1 mg/l
Total phosphorus	epilimnetic core	0.001 (DEP method)
Chlorophyll a	epilimnetic core	0.001
Color	epilimnetic core	1.0 SPU
pH	epilimnetic core	0.1 SU
Total alkalinity	epilimnetic core	1.0 mg/l

*Profiles shall consist of temperature and dissolved oxygen measurements taken every meter up to 15 meters, every other meter to 25 meters, then every 5 meters thereafter.

In addition, during late summer (mid to late August depending on latitude and weather conditions), water samples shall be collected and analyzed from up to three depths in the water column. An integrated epilimnetic sample will be collected and analyzed for the parameters below; if the waterbody is deep enough to have a hypolimnion, samples will be collected at the top of the hypolimnion and one meter above the sediment and analyzed for all parameters below except Chlorophyll a.

Parameter	Detection limit
Total phosphorus	0.001 mg/l
Nitrate	1 ueq/l
Chlorophyll a (uncorrected)	0.001 mg/l (trichromatic determination)
Color	1.0 SPU
DOC	0.25 mg/l
pH	0.1 SU
Total alkalinity	1.0 mg/l
Total iron	0.005 mg/l
Total dissolved aluminum	0.010 mg/l
Total calcium	1.0 mg/l
Total magnesium	0.1 mg/l
Total sodium	0.05 mg/l
Total potassium	0.05 mg/l
Total silica	0.05 mg/l
Specific conductance	1 ms/cm
Chloride	2 ueq/l
Sulfate	2 ueq/l

Additional sampling may be required due to the hydraulic or physical characteristics of a given waterbody or to the presence of significant water quality problems.

Habitat Study

For lakes, ponds, and riverine impoundments, determination of attainment of the designated use 'habitat for fish and other aquatic life' will be determined as follows. Using a depth of twice the mean summer Secchi disk transparency, determined from the Trophic State Study or historic DEP data, as the bottom of the littoral zone, the volume and surface area dewatered by the drawdown will be calculated to determine if at least 75% of the littoral zone remains watered at all times. Alternatively, studies of fish and other aquatic life communities, including freshwater mussels, may be conducted to demonstrate that the project maintains 'structure and function of the resident biological community' despite a drawdown that results in less than 75% of the littoral zone remaining watered at all times.

Fishing (Mercury Contamination) Study

To ensure that the project does not contribute to the Statewide Fish Consumption Advisory due to mercury, projects with excessive drawdowns (generally >10 feet) may be required to analyze sport fish from the project waterbody and one or more reference waters for mercury. Contact DEP for specific requirements for each project.

RIVERS AND STREAMS

Temperature and Dissolved Oxygen Study

Applicability

This rivers and streams sampling protocol shall apply to tailwater areas that are not impoundments where existing data are insufficient to determine existing and future water quality.

Sampling Stations

Sampling shall occur in the tailwater downstream from the turbine/gate outlet or dam at a location representative of downstream flow as agreed by DEP on a case by case basis. Initially, measurements of temperature and dissolved oxygen should be made along a transect across the stream at the first, second and third quarter points across the width. Subsequent measurements should be made at the location shown to be representative of the main flow. Sampling should also occur in any bypassed segment of the river created by the project. Additional sampling stations may be required in the upstream or downstream areas where significant point or nonpoint sources exist or where slow moving or deep water occurs. The number and spacing of any additional stations will be determined by DEP on a case-by-case basis.

Parameters

Temperature and dissolved oxygen shall be sampled at mid-depth in rivers less than 2 m deep or in a profile of 1 meter increments of depth in rivers greater than 2 m deep. In rivers where it is already known that attainment of required statutory dissolved oxygen criteria is questionable, sampling for additional parameters (e.g. BOD, nitrogen, phosphorus) may be necessary.

Frequency and Timing

Sampling should be conducted during the summer low flow high temperature period, with the ideal conditions being the 7Q10 flow (the 7 day average low flow with a 10 year recurrence interval) combined with daily average water temperatures exceeding 24 ^{o}C. Measurements of temperature and dissolved oxygen shall be made every hour with a datasonde in remote unattended mode continuously during July and August, unless high flows well above seasonal median flows occur.

Alternatively, with concurrence by DEP, sampling could be undertaken one day per week for a minimum of ten weeks throughout the summer low flow, high temperature period. Each discrete grab sampling event for temperature and dissolved oxygen would consist of a minimum of two daily runs, the first of which should occur before 7 AM and the second of which should occur after 2 PM. Sampling results will not be considered complete unless a minimum of 5 sampling days meets the following conditions: The product of the water temperature (^{o}C) and the flow duration (the percentage of the time a given flow is statistically exceeded) at the time of sampling exceeds 1500. For cycling hydropower projects, in addition to twice daily monitoring, continuous monitoring may be required at some locations for a duration equivalent to the period of one cycle of the storage and the release of flow.

For either method, a summer in which low flows and high temperatures are not experienced may result in additional sampling requirements for the next summer. Low flow conditions may occur naturally, as an unregulated river or may be artificially induced, as in the case of upstream flow

regulation or flows downstream from a cycling or peaking power project or in the case of a bypassed segment which receives flow only by spillage, leakage or specific releases.

Available Data

The use of data already available is encouraged provided that adequate QA/QC procedures have been followed. Old data may not be acceptable for considerations of meeting minimum sampling requirements, but could still provide useful information. Acceptance/rejection of data will be determined on a case by case basis, but generally data more than 10 years old may be rejected.

Habitat and Aquatic Life Studies

For rivers and streams, determination of attainment of the designated use 'habitat for fish and other aquatic life' will be determined as follows. A Cross-Section Flow Study is required that measures width and depth at various flows to determine the flow at which at least 75% of the bank full cross-sectional area of the river or stream is continuously watered. At least three cross-sections representative of the river or stream must be measured. Alternately, a combination of ambient measurements in one cross-section, flow data from existing flow gages, and/or modelling may be approved by DEP.

In addition, to determine if the project 'attains the aquatic life criteria, i.e. 'maintains the structure and function of the resident biological community', biological monitoring of the benthic macroinvertebrate community must be conducted following DEP's standard protocol in Methods for Biological Sampling and Analysis of Maine's Rivers and Streams, DEP LW0387-B2002.
A copy can be found at www.maine.gov/dep/water/monitoring/biomonitoring/material.html

PAUL R. LEPAGE
GOVERNOR

STATE OF MAINE
DEPARTMENT OF
INLAND FISHERIES & WILDLIFE
284 STATE STREET
41 STATE HOUSE STATION
AUGUSTA ME 04333-0041

CHANDLER E. WOODCOCK
COMMISSIONER

June 17, 2014

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington D.C. 20426

RE: Study Request, Lower Barker Hydroelectric (FERC No. 2808), KEI (Maine) Power Management (III)

Dear Secretary Bose:

On January 31, 2014, KEI (Maine) Power Management (III) LLC [KEI (Maine)] filed the Pre-Application Document (PAD) for the Lower Barker Hydroelectric Project (FERC No. 2808) with the Commission. On March 19, 2014 the Commission granted the use of the Traditional Licensing Process (TLP) for the Lower Barker Project. On May 5, 2014 the Fisheries Division of the Maine Department of Inland Fisheries and Wildlife (MDIFW) filed initial comments on the PAD.

This filing contains MDIFW's formal study request based on the PAD and 5/19/14 consultation meeting. The MDIFW is the state agency responsible for the management of resident fisheries in inland waters of Maine. The Maine Department of Marine Resources (MDMR) is responsible for the management of marine and diadromous fish.

The PAD identifies a year-round minimum flow of 20 cfs as an existing license requirement within the lengthy bypass channel which extends approximately ½ mile to the confluence with the tailrace. The river extends an additional ¼ mile beyond the tailrace to the confluence with the Androscoggin River. The required minimum flow supports downstream fish passage for migratory fish (managed by the MDMR) from June 1 through November 15. During a December 17, 2013 agency consultation meeting a KEI representative indicated that an additional 10 to 15 cfs is also released for migratory eel passage. During the 5/19/14 consultation meeting a KEI representative indicated that the actual total year round minimum flow maintained in the bypass is approximately 30 CFS.

The bypass channel (original river channel) associated with Lower Barker Dam was stocked by the MDIFW with both brook trout and brown trout until 2000, when scheduled stockings were suspended due to low flows and concerns regarding availability of public access and parking. At times the bypass flows were so low that MDIFW hatchery personnel expressed concerns about stocking the bypass. Available observations and anecdotal reports suggest highly variable flow conditions in the bypass channel, including low flows that are not conducive to developing successful trout fisheries. The Department has developed successful, well-used fisheries at other upriver locations below existing dams including Hackett's and Welchville dams.

The MDIFW's fishery management goal for the lower Androscoggin River, including the bypass associated with Lower Barker Dam, is to develop a trout fishery that persists through the open water fishing season (April 1 – Oct 31), with the expectation of some trout holding over from one year to the next. The relatively long bypass channel offers an abundance of potential trout habitat (under suitable flows). Furthermore, the juxtaposition of the bypass to a heavily populated urban area offers high public use opportunity. The availability of suitable year round flows in the bypass would enable the MDIFW to create a highly desired and well used trout fishery and would likely utilize a similar stocking plan to that used at upriver locations, which would include stocking legal size brown and rainbow trout, and possibly some brook trout.

In support of the MDIFW's trout management objective for Lower Barker Bypass the following information/studies are requested:

We request a flow demonstration study to assess habitat suitability for adult rainbow trout in the bypass under a range of flow releases, including a release that will extend beyond optimal suitability for target species life stages. The collected information will be used to identify recommended minimum flow releases to enhance trout habitat in the bypass in support of MDIFW trout management objectives. The bypass currently provides good substrate habitat for trout management, but lacks suitable flows to support successful management by MDIFW.

KA, the applicant's consultant, recently conducted a semi-quantitative incremental flow evaluation of a series of flow releases below West Buxton Dam on the Saco River to assess trout habitat suitability. The evaluation was designed to evaluate trout habitat suitability using agreed upon rating curses (HSC depth/velocity/cover) for target species life stages and reference transects identified in the field. Current minimum flow and three agreed upon alternative flows were released for evaluation. Transect data was collected at each flow and each flow was photo documented, along with observations to reflect bypass changes not documented in association with transect data collection. This relatively low cost assessment methodology relied upon KA staff and interested fishery agency reps to participate in the rating of each release. The methodology relied on quantitative data collection at selected transect locations, as well as more qualitative interpretive observations made by raters regarding changes in habitat suitability. The MDIFW would support and participate in this type of low cost collaborative assessment at Lower Barker Dam, but is also open to considering more qualitative and costly assessment methodologies.

In addition, the applicant is proposing a Form 80 assessment to document the level of existing recreation use on the project. The MDIFW is requesting a recreation use study/investigation with different objectives than those provided under the Form 80 process. MDIFW objectives include an inventory of (including pictures) and to map of existing recreational infrastructure including but not limited to facility locations, amenities, angler access and parking, trails, signage, portage take outs and put-ins, as well as portage routes. The map would clearly define the extent of flowage rights (KEI indicated flowage rights extend to 165.7 MSL) and especially property ownership, particularly along the bypass and along the head pond. Additional existing "public" access infrastructure in state/city/land trust ownership located within or in close proximity to the project foot print that may already provide recreational access opportunities should also be identified and mapped. Furthermore, future recreational access improvements proposed by the applicant should be identified and schematically displayed on a map and should at a minimum address the need for:

- walk-in access and parking associated with planned MDIFW trout management under enhanced minimum bypass flows and subsequent MDIFW stocking;
- suitable parking and safe, environmentally responsible canoe/kayak put-in and take out accommodations, along with a safe, sign-marked portage trail from the head pond to below the tailrace;
- hand carry boat access to the small head pond may be developed at the portage take out, with the expectation that parking accommodations are located in very close proximity to the launch site.

The MDIFW is also seeking a clear understanding of how KEI will manage public access in regards to flows, time of year, and time of day restrictions to understand when recreational use by the public would not be permitted. In addition, the City of Auburn has expressed an interest in developing lands along the Little Androscoggin River for recreational access to the river. That interest and any associated planning that has been developed by the City should be included in the development of a recreational use study requested by MDIFW to provide a broader understanding of how to integrate state and local interests associated with identified recreational access needs.

Evidence of incidental recreational use was observed during the 5/19/14 site walk, but none of the existing points of access are "developed and acknowledged with inviting signage", and the current condition of these informal sites do not encourage public use and awareness of any available access to KEI property. Recreational use is an important consideration on this project based on comments expressed to date by the public, the City of Auburn, and MDIFW. The requested low cost assessment will provide baseline information to make informed coordinated decisions regarding the need, location and placement of recreational access amenities.

Francis Brautigam
MDIFW Regional Fisheries Biologist
Sebago Lake Region

STATE OF MAINE
DEPARTMENT OF MARINE RESOURCES
21 STATE HOUSE STATION
AUGUSTA, MAINE
04333-0021

PAUL R. LEPAGE
GOVERNOR

PATRICK C. KELIHER
COMMISSIONER

June 27, 2014

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, DC 20426

RE: Study Requests
Lower Barker Project (P-2808)

Dear Secretary Bose:

On January 31, 2014, the Pre-Application Document (PAD) for the Lower Barker Project (FERC No. 2808) was filed with the Commission by KEI (Maine) Power Management (III) LLC [KEI (Maine)]. On March 19, 2014 the Commission granted the use of the Traditional Licensing Process (TLP) for the Lower Barker Project. On May 8, 2014 the Maine Department of Marine Resources (MDMR) filed comments with KEI (Maine) on the PAD. MDMR was unable to participate in the Joint Agency Meeting on May 19.

Background

The Lower Barker Project is located on the Little Androscoggin River, and impacts three species of diadromous fishes. Anadromous alewives, endangered Atlantic salmon, and catadromous American eels currently have access to the waters below the Project. Alewives and American eels also are located above Project. Since 1984, MDMR has stocked three ponds (Taylor Pond, Marshall Pond, and Lower Range Pond) located above the Lower Barker Project with a total of 181,800 pre-spawning alewife. The Lower Barker Project does not have upstream fish passage facilities, and therefore, completely blocks the upstream migration of alewife and Atlantic salmon and likely impedes the passage of American eel. The current minimum flow in the bypass is likely insufficient to provide a zone of passage for upstream migrating alewives and salmon. The Lower Barker Project provides a measure of downstream passage; however, we have records of fish kills of outmigrating juvenile alewives in the past. Therefore, MDMR has an interest in the relicensing of the Project and the measures to protect, mitigate damages to, and enhance fish resources that will be included as elements of the federal license.

OFFICES AT 2 BEECH ST., BAKER BUILDING, HALLOWELL, MAINE
http://www.Maine.gov/dmr

PHONE: (207) 624-6550
(207) 624-6024

FAX:

Study Requests

MDMR requests three studies that are relevant to upstream and downstream passage of diadromous fish species at the Project:

1. Upstream fish passage information needs
2. Eel passage siting
3. Effectiveness testing of existing downstream passage

Study 1. Upstream fish passage information needs

1. Goals and objectives

The goal is to gather information that will be needed to design upstream fish passage for alewife, American eel, and Atlantic salmon that is safe, timely, and effective. Specific objectives are to 1) verify gauge prorations, 2) develop current headwater and tailwater rating curves, and 2) measure water velocity and water depth at different flows in the bypass and tailrace during the upstream migration season or at flows that would be experienced during the migration season (May 1-October 31).

2. Relevant resource management goals

MDMR is a cabinet level agency of the State of Maine. MDMR was established to regulate, conserve, and develop marine, estuarine, and diadromous fish resources; to conduct and sponsor scientific research; to promote and develop marine coastal industries; to advise and cooperate with state, local, and federal officials concerning activities in coastal waters; and to implement, administer, and enforce the laws and regulations necessary for these purposes. MDMR is the lead state agency in the restoration and management of diadromous (anadromous and catadromous) species of fishes.

MDMR's management goal is restore alewife, blueback herring, American shad, American eel, and Atlantic salmon to their historic habitat in the Androscoggin River watershed, which includes Little Androscoggin River and the Sabattus River. MDMR has been actively restoring alewife to their historic range in the Little Androscoggin Rivers since 1984 by stocking pre-spawning adults into inaccessible habitat and ensuring that effective upstream and downstream fish passage is provided for this species. MDMR is restoring Atlantic salmon to the Androscoggin watershed by allowing adult returns to migrate upstream to accessible spawning habitat in tributaries. Effective upstream and downstream fish passage is critical for this passive restoration. MDMR is enhancing American eel within their historic range in the Androscoggin watershed by ensuring that effective upstream and downstream fish passage is available to the species. Currently the three mainstem hydropower projects downstream of the Lower Barker Project have upstream passage that is utilized by these species.

3. Existing information

The PAD does not contain headpond or tailwater rating curves or information on water velocities and water depth in the bypass and tailwater reaches during the migration season. These data will be critical for siting and designing upstream fish passage.

4. Nexus between project operations and effects

The Project currently blocks the upstream passage of anadromous alewife and Atlantic salmon, and likely delays or inhibits the upstream movement of American eel. The data provided by these studies will inform designs for upstream fish passage facilities.

5. Study methods

USGS gauge prorations and headwater and tailwater rating curves may already have been developed for the project. If so, we request the calculations that were used for the gauge prorations, the calculations and formulas that were used for the Headwater Rating Curve, and the raw data and source of data used for the Tailwater Rating Curve. We also request that the licensee identify the vertical datum used for these curves. If this information is not currently available, standard computations typically are made in a spreadsheet (e.g. Excel) to develop the Headwater Rating Curve and modeling or empirical data are used to develop the Tailwater Rating Curve.

Water velocity and water depth at different flows in the bypass and tailrace could be determined with a semi-quantitative incremental flow evaluation of a series of flow releases at the Lower Barker Dam. The current minimum flow and several alternative flows, previously agreed upon by the resource agencies, should be released for evaluation. Water velocity and water depth should be measured at 3-5 nodes across each of several transects in the bypass and at the bypass and tailrace confluence, with the locations of these transects previously agreed upon by the agencies. Transects also should be photo documented at each flow. This study could be combined with a similar one requested by the Department of Inland Fisheries and Wildlife.

6. Level of effort and cost and consideration of alternative studies

The study can be completed in a single season, and the field work probably could be completed in a week or less. Modeling of the bypass reach and tailrace would be an alternative method, but would require some field measurements for model verification.

Study 2. Eel Passage Facility Design and Siting

1. Goals and objectives

The goal of the study is to determine appropriate designs and locations for upstream and downstream eel passage facilities, and to determine their operating criteria for the Lower Barker Project.

2. Relevant resource management goals

See description in Study 1.

3. Existing information

MDMR is not aware of any existing information regarding the timing of upstream and downstream eel migration, size distribution of eels or the behavior of migrants at the Project.

4. Nexus between project operations and effects

The Lower Barker Project blocks or inhibits the upstream movement of American eel. Passage facilities are needed to reestablish the connection between American eel growth and spawning habitats.

5. Study methods

A phased approach is appropriate for the design and implementation of American eel passage. An initial field study of eel abundance and behavior at the downstream face of the powerhouse and spillway should be conducted to inform fishway location and design decisions. This should be followed by upstream fishway final design and construction. Finally, an adaptive approach should be developed to monitor and refine the facilities and their operation. Downstream passage will be informed by Study 3.

6. Level of effort and cost and consideration of alternative studies

Field work is required to inform the fishway design and location. This would be a low level of effort that may span one or two field seasons, depending on eel abundance.

Study 3. Downstream fish passage effectiveness

1. Goals and objectives

The goal of the study is to evaluate the effectiveness of the existing downstream fish passage facility at the Project for juvenile and adult alewife and adult American eel if KEI (Maine) proposes to continue using this facility, which consists of passing the minimum flow of 20 cfs from the stoplog section of the spillway between June 1 and November 15. This facility appears to meet the minimum USFWS criteria for downstream passage flow (flow ≥ 4-5% of station hydraulic capacity). However, it is unclear if the facility meets minimum USFWS criteria for bypass weir dimension (minimum bypass weir dimensions of 2 feet deep and 3 foot wide) and it does not meet the criteria for a plunge pool (4 feet deep or 25% of fall height, whichever is greater minimum). The lack of an appropriate plunge pool resulted in a documented kill of outmigrating juvenile alewife in 2000.

2. Relevant resource management goals

See description in Study 1.

3. Existing information

It is our understanding that the effectiveness of this downstream passage facility has never been tested.

4. Nexus between project operations and effects

Fish that migrate downstream past the Lower Barker project are susceptible to impingement on Project trashracks, entrainment through the Project's turbine when the Project is operating, or dropping approximately 30' onto ledge. Evaluation of the effectiveness of this passage is necessary if the Licensee proposes to continue using it to pass downstream migrants.

5. Study methods

A number of different field methods could be used to assess passage effectiveness at the Project – these are well-established and include: hydroacoustic monitoring (all species and life stages), radio telemetry (adult fish), or observation using camera systems (juveniles). These methods are well established and have been used successfully in other Commission licensing proceedings.

6. Level of effort and cost and consideration of alternative studies

Field work would be required to collect data on the species that may be entrained, studying the behavior of fish at the intake, and obtaining water velocity data. Depending on outcome of the first year of the study and sampling size, an additional year of data collection may be necessary.

If you have any questions, please contact Gail Wippelhauser at 207-624-6349 or gail.wippelhauser@maine.gov.

Sincerely,

Patrick C. Keliher, Commissioner

cc: Oliver Cox, Paul Christman, DMR
John Perry, Francis Brautigam, DIFW
Kathy Howatt, DEP
Steven Shepard, Antonio Bentivoglio, Brett Towler, USFWS
Sean McDermott, Bill McDavitt, Jeff Murphy, Don Dow NOAA

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
55 Great Republic Drive
Gloucester, MA 01930-2276

JUL 10 2014

Kimberly D. Bose, Secretary
Federal Energy Regulatory Division
888 First Street, N.E.
Washington, D.C. 20426

RE: Comments on the KEI (Maine) Pre-Application Document and Study Requests for the Lower Barker Hydroelectric Project (FERC No. 2808)

Dear Secretary Bose,

On March 19, 2014, you issued a Notice of Intent to file license application, filing of Pre-Application Document (PAD), and approving use of the Traditional License Process. The PAD contains information about the Lower Barker Project itself and the environmental resources that are affected by the Project. Attached for filing, please find our comments regarding the PAD as well as a request for six studies. If you have any questions or need additional information, please contact Sean McDermott via email (sean.mcdermott@noaa.gov) or 978-281-9113.

Sincerely,

Louis A. Chiarella
Assistant Regional Administrator
for Habitat Conservation

cc: Service List
Steven Shepard, USFWS
Antonio Bentivoglio, USFWS
Francis Brautigam, MEDIFW
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Jim Pellerin, MEDIFW
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Paul Christman, MEDMR
Oliver Cox, MEDMR
Kathy Howatt, MEDEP
John Burrows, ASF

National Marine Fisheries Service's Comments and Study Requests on KEI (Maine) Pre-Application Document for the Lower Barker Hydroelectric Project (FERC No. 2808)

July, 2014

1.0 COMMENTS ON THE PRE-APPLICATION DOCUMENT (PAD)

The pre-application document (PAD) contains information about the Project's structure and operations and affected environmental resources. We offer the following comments based on our review of the PAD.

1.1 PAD Section 3.1 [River Basin] Overview

Project flow data are derived from the U.S. Geological Survey (USGS) gaging station at South Paris on the Little Androscoggin River (USGS No. 01057000). Data from this gage includes water years from 1913 to 1924 and from 1931-2013. Flow duration curves available in the PAD use data from waters years 1985 to 2013.

NMFS comment
Published studies project shifting hydroclimatic and hydrologic conditions for New England streams and rivers over the next century as a result of climate change (Huntington et al. 2009, Horton et al. 2014; Melillo et al. 2014). These projected shifts include more intense precipitation events at greater frequency and an increased potential for drought-like conditions. Studies also indicate distinct trends in increasing flood risk since the early 1970's (Collins 2009). In brief, seasonal flow conditions observed in the past 80 years are no longer the norm. We can expect a changing baseline flow condition throughout the Northeast such that extreme high and low flow conditions are more prevalent.

Climate change and the resultant changes in baseline environmental conditions during the next 30-50 years will influence Project operations, scope and scale of the Project related environmental impacts and the effectiveness of mitigation measures (e.g., fish passage). As a result, the public benefit of this development project located within a trust resource (i.e., the river) could diminish rapidly. For example, the applicant indicates the plant factor is 61% (see comment below regarding "plant factor"). Regional changes in precipitation events and riverine flow patterns could reduce the average annual energy output; reduce profitability; and influence the effectiveness of fish passage measures. As such, the changing

baseline conditions will alter the balance between public benefit and impacts on trust resources. The final National Environmental Policy Act documents used to support your decision process should consider recent changes in observed precipitation events in the hydraulic model and climate change projections in establishing public benefit (see Study Request for a "Flow Duration Curve Assessment").

1.2 PAD Section 4.4.2 Low Flow Operations

The applicant states the Project maintains a minimum flow for the bypass reach of 20 cfs. This flow was developed in consultation with the agencies during the previous licensing process.

NMFS comment
Presently we do not have access to the full administrative record dating back to the previous licensing, including the cited reference for determining this minimum flow. We are uncertain whether this minimum flow was established using the U.S. Fish and Wildlife Service's Aquatic Base Flow method, a site specific in-stream flow study, or other method. That said, technology and management priorities have changed since 1979. Atlantic salmon (Salmo salar) are now listed as endangered under the Endangered Species Act (ESA). River herring are considered a species of concern and recently underwent a status review for consideration as threatened or endangered under the ESA. The bypass reach itself is more than a half mile long (2,850 feet). Habitat in this reach could prove suitable for spawning adult and out-migrating juvenile diadromous species. The bypass reach minimum flow should be re-evaluated with current management priorities in mind. Our study request to "Bypass Reach In-stream Flow Study" reflects this comment.

1.3 PAD Section 4.6.4 Summary of Project Generation and Outflow Records

This section of the PAD indicates the Project has a plant factor of 49%. The formula provided immediately after this statement indicates a 61% plant factor. This plant factor value of 61% is repeated in Section 4.6.7 (Average Annual Energy and Dependability Capacity).

NMFS comment
We recommend clarification of the plant factor in the final application.

1.4 PAD Section 5.3.1.1 Fish Species and Habitat [River Herring]

This subsection of the PAD states: "The total adult river herring release target for the Androscoggin watershed is 27,358 river herring into 1,846 ha (equivalent to 14.8 fish/ha) of upstream habitat available for restoration (MDMR, 2010). During the past ten years (2002-2013), the number of adults captured at the Brunswick fishway available for transport and release was greater than the amount of upstream spawning and nursery habitat available (Table 5.3-2)."

NMFS comment
During the twelve year period the applicant highlights river herring returns, eleven exceeded targeted stocking rates. Further, based on Table 5.3-2 (Upstream anadromous fish passage counts at the Brunswick Hydroelectric Project) of the PAD, river herring returns have generalyl increased since 1998. The target number of stocked fish, however, does not necessarily correlate to available habitat. Stocking rates tend to be less than overall restoration goals simply because of logistical constraints. Therefore, it is inaccurate to state that "...transport and release [of river herring] was greater than the amount of upstream spawning and nursery habitat available." The available habitat may be much greater. It is our understanding that Maine Department of Marine Resources is working on an Androscoggin River management plan. Once completed, that should clearly identify the State's restoration goals for the watershed.

1.5 PAD Section 5.3.1.1 Fish Species and Habitat [American eel]

This subsection of the PAD states "The American eel occur in the Project area as a result of natural upstream and downstream passage during the spring, summer, and fall months." Further, the PAD indicates that only the Worumbo Project on the Androscoggin River has an upstream eel passage facility.

NMFS comment
We disagree with characterizing fish passage around a dam as "natural passage". While the fish are moving volitionally, the dam presents an unnatural barrier which increases the risk of injury and mortality, as well as delaying passage to upstream nursery habitat. American eel (Anguilla rostrata) are unique among the diadromous species. They have the ability to scale wetted surfaces, to an extent, including the face of a dam, ledge outcrops and other landscape features (Solomon and Beach 2004). That said, we strive to ensure passage is safe, timely and effective to support restoration of the species.

1.6 PAD Section 5.6 Threatened and Endangered Species

NMFS comment
The Gulf of Maine Distinct Population Segment (GOM DPS) of Atlantic salmon is listed as endangered under the ESA. The GOM DPS includes all anadromous Atlantic salmon whose freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River. Included are all associated conservation hatchery populations used to supplement these natural populations; currently, such conservation hatchery populations are maintained at Green Lake National Fish Hatchery and Craig Brook National Fish Hatchery. The Lower Barker Project is located within the range of the GOM DPS of Atlantic salmon and thus, has the potential to affect the species. The species occurs within the Lower Barker Project boundary. As such, potential impacts to listed

Atlantic salmon as a result of Project operations must be addressed within the context of this licensing proceeding.

Critical habitat has been designated for listed Atlantic salmon pursuant to section 4(a)(3) of the ESA. The critical habitat designation for the GOM DPS includes 45 specific areas occupied by Atlantic salmon at the time of listing. The critical habitat designation includes approximately19,571 km of perennial river, stream, and estuary habitat and 799 square kilometers of lake habitat within the range of the GOM DPS and in which are found those physical and biological features essential to the conservation of the species. The entire occupied range of the GOM DPS in which critical habitat is designated is within the State of Maine. The Lower Barker Project is not directly located within designated critical habitat for Atlantic salmon; however, operations at the project could potentially affect Atlantic salmon critical habitat 0.75 miles downstream in the mainstem Androscoggin River.

Atlantic salmon are jointly listed by us and the U.S. Fish and Wildlife Service, collectively referred to as the "Services." Pursuant to a March 2009 Statement of Cooperation between the Services concerning implementation of the ESA for endangered Atlantic Salmon, we have the lead for all section 7 consultations concerning Atlantic salmon and federally licensed hydropower projects in the GOM DPS of Atlantic salmon. The overarching goals of the Services with respect to endangered Atlantic salmon are to recover the species and conserve the ecosystem on which they depend. To that end, we fully expect to restore Atlantic salmon to the Little Androscoggin River, which includes the Lower Barker Project area, within the term of any new license issued by the Commission. Our comments and study requests are intended to facilitate our goals to protect and recover the GOM DPS of Atlantic salmon pursuant to our authorities under the ESA.

Five Atlantic sturgeon (Acipenser oxyrinchus oxyrinchus) DPSs, including the GOM DPS, and shortnose sturgeon (A. brevirostrum) are listed under the ESA and are present in the Androscoggin River. The Lower Barker Project is located above the historic range of both of these species. Thus, direct impacts from the project are not expected. It is, however, important to identify any indirect effects that may be present below the dam and within the range of these species.

2.0 STUDY REQUESTS

We recommend the following six studies be conducted during the study phase of the relicensing activity. Each study is supported using the Commission's study plan criteria 18 CFR 5.9(b). Several of these studies compliment the study requests of the Maine Department of Marine Resources for evaluating upstream passage needs and downstream passage efficiency. Information derived from each of these studies will inform the decision process

during this licensing action.

2.1 Upstream Fish Passage – Powerhouse tailrace hydraulics

2.2 Upstream Fish Passage – Telemetry Studies

2.3 American Eel Survey

2.4 Downstream Fish Passage Effectiveness and Survival: Behavior, Entrainment and Impingement at the Intake.

2.5 Bypass Reach In-stream Flow Study

2.6 Flow Duration Curve Re-assessment

2.1 Upstream Fish Passage – Powerhouse tailrace hydraulics

The applicant indicates that alewife (*Alosa pseudoharengus*), blueback herring (*A. aestivalis*), American shad (*A. sapidissima*), Atlantic salmon and American eel historically ascended the Little Androscoggin River to Biscoe Falls. Dams on the mainstem Androscoggin and Little Androscoggin prevented passage of these sea run fish for many decades. Presently, fish passage on the Androscoggin River provides access to the Lower Barker Dam. The Lower Barker Dam is the first barrier on the Little Androscoggin River preventing upstream migration to targeted spawning habitat. Installing upstream fish passage at the Lower Barker Dam will address direct project related impacts and facilitate restoration of sea-run fish within the Androscoggin watershed.

Upstream fish passage measures implemented should be safe, timely and effective for each target species. Achieving this goal requires site specific data to understand flow conditions at the Project. We request a detailed hydraulic study of the existing conditions at the powerhouse and tailrace. When a conceptual fishway is proposed, this model can be modified to examine flow fields when attraction water from the fishway is included in the model. KEI (Maine) should establish rigorous criteria for the study in consultation with the resource agencies. Consultation with the resource agencies regarding fish passage designs will be necessary prior to filing with the Commission.

Study Plan Criteria

1. Siting of a fishway entrance and attraction flows are critical to the success of a fishway (NMFS 2012). The goal of this study is to inform the decision process for siting and development of a safe, timely and effective upstream anadromous fishway. The objectives of this study are to (a) understand flow velocities and directions in and around the tailraces of both powerhouses and (b) add a conceptual fishway design to this model to understand how attraction water will change the existing flow field. Results of this study will be used in conjunction with the telemetry study described below.

2. The relevant resource management goals are captured in our Next Generation Strategic Plan (NOAA 2010). Identified in this plan is the long-term goal of healthy oceans which support healthy populations of marine species and sustainable commercial and recreational fisheries. Further, our involvement supports the management objectives of the Atlantic States Marine Fisheries Commission Interstate Fishery Management Plan for Shad and River Herring (ASMFC 2009) as well as our mandates under the Fish and Wildlife Coordination Act, Magnuson-Stevens Fishery Conservation and Management Act and the Endangered Species Act.

3. The requestor, the National Marine Fisheries Service, is a federal resource agency with a mandate to protect and conserve fisheries resources and associated habitat.

4. To date, no detailed hydraulic modeling has been conducted for the Lower Barker powerhouse and tailrace. Absent these data, it is difficult to discern what flow field dynamics will exist when a conceptual fishway is put forth by the Licensee.

5. As fisheries restoration goals advance, the Lower Barker Project will present a barrier to upstream migrating anadromous fish, directly affecting access to spawning habitat. Upstream fish passage will be needed for target species. Hydraulic conditions resulting from project operations will affect migratory fish behavior. Evaluating the hydraulics at the Project during the study phase will assist in the consultation process for developing the fishway, inform the siting and design of the fishway, as well as determining the location and number of entrance(s), and comprise part of the administrative record in support of potential Section 18 prescriptions or 10(j) recommendations.

6. Computation fluid dynamics (CFD) modeling has become an increasingly common practice at hydro-electric projects. While numeric hydraulic models do rely on a number of assumptions, the output provides important information for engineers and fish biologists in their consultations with the licensee to improve fishway design. A comparable example of this type of modeling would include the Milford tailrace modeling that was conducted by Baird on behalf of Black Bear Hydro whereby 3D CFD modeling of the tailrace was conducted (BBHP 2011).

7. The level of effort and cost is commensurate with a project the size of the Lower Barker Project and the likely license term. Only a CFD model can provide the magnitude and direction of water velocities exiting the tailrace and a proposed fishway. *In situ* flow measurements cannot provide any insight into a proposed fishway and they do not provide the same spatial scope of a CFD model. Development of a physical model is cost prohibitive and would be considered an unreasonable level of effort for this Project. No other study has been proposed by the applicant.

2.2 Upstream Fish Passage – Telemetry Studies

Dams are fundamentally designed to alter flow regimes within rivers primarily for power generation, flood control and navigation (Poff and Hart 2002). This direct change in flow patterns affects the behavior of migrating fish (Larinier 2000). For upstream migrating adults, changes in flow patterns could reduce the usable zone of passage leading to a fishway entrance or may lead to a 'dead-end' away from a fishway facility. Therefore, in addition to the detailed hydraulic analysis, we request a telemetry study to better understand the movement and behavior of fish immediately downstream of the Lower Barker Project. The combination of the hydraulic and biological assessments will provide important information for the development and siting of upstream anadromous fish passage. KEI (Maine) should establish rigorous criteria for the study in consultation with the resource agencies. Consultation with the resource agencies will be necessary regarding fish passage designs prior to filing with the Commission.

Study Plan Criteria

1. The goal of the telemetry study is to inform the decision process for siting and development of a safe, timely and effective upstream diadromous fishways. The objectives of this study are to (a) evaluate the route migratory fish use as they approach the Project and (b) understand the behavior of migratory fish as they approach the water influenced by the Project's operations. When the data from this study are coupled with the data from the hydraulic modeling study, a significantly enhanced understanding of the eco-hydraulics of the Project can be developed.

2. The relevant resource management goals are captured in our Next Generation Strategic Plan (NOAA 2010). Identified in this plan is the long-term goal of healthy oceans which support healthy populations of marine species and sustainable commercial and recreational fisheries. Further, our involvement supports the management objectives of the Atlantic States Marine Fisheries Commission Interstate Fishery Management Plan for Shad and River Herring (ASMFC 2009) as well as our mandates under the Fish and Wildlife Coordination Act, Magnuson-Stevens Fishery Conservation and Management Act and the Endangered Species Act.

3. The requestor, the National Marine Fisheries Service, is a federal resource agency with a mandate to protect and conserve fisheries resources and associated habitat.

4. Riverine flow patterns are a critical competent to designing fishways such that flow conditions influence migration behavior (NMFS 2012). By design, hydropower projects modify riverine flow conditions for generating power. The design, type, and placement of fish passage facilities will be affected by the biological response to Project related flow conditions. Currently, no information exists to determine how upstream migrating

diadromous fish respond to spillway and powerhouse flow conditions. Data from this study will be used to improve the design process for upstream anadromous fishways. Data from this study, when coupled with the requested hydraulic study results will dramatically improve our understanding of the eco-hydraulics of the Project and will provide valuable information during the design process.

5. As fisheries restoration goals advance, migratory fish will use the stretch of water above and below the Lower Barker Project. These fish use flow to orient their migratory path. Project operations affect flow fields surrounding the Project. Evaluating the response of migratory fish to these flow fields during the study phase will assist in the consultation process for developing safe, timely and effective fishways, inform the siting and design of the fishways, as well as determining the location and number of entrance(s). These data will also comprise part of the administrative record in support of potential Section 18 prescriptions or 10(j) recommendations.

6. Radio telemetry studies are a commonly accepted field method for assessing in-stream behavior of migratory fish. A well-executed radio telemetry study can track the location of fish within the river. At a minimum, arrays should be placed to detect fish that might be attracted to flow from the powerhouse and spillway. Upstream migrating American shad and/or river herring can be handled and tagged at Brunswick or other location and released in the vicinity of the Lower Barker Project. This is a generally accepted practice when initial fish passage design work commences.

7. The level of effort and cost is commensurate with a project the size of the Lower Barker Project and the likely license term. A telemetry study could be complete in one migration season with potential for a second season depending on success of the implementation and seasonal conditions. Given that water passes the Project via the power house and a spillway almost half a mile upstream, an understanding of where migrating fish are attracted under varying flow conditions will be necessary. No other study has been proposed by the applicant. Other accepted monitoring protocol such as passive integrated transponders (PIT tagging) are limited and do not provide the scope of behavioral data that radio telemetry provides.

2.3 Upstream American Eel Passage Assessment

The PAD identifies American eel as present in the Project area. Dams, such as the Lower Barker Dam, are known to impair migration success for diadromous species such as American eel (ASMFC 2013). Presently, upstream and downstream passage facilities specific to the needs of migrating adult and juvenile eels are not currently available. Installing upstream fish passage at the Lower Barker Dam will address direct project related impacts and facilitate restoration of American eel within the Androscoggin watershed. The study request below is intended to provide data necessary to develop reasonable and prudent

conservation measures, specifically safe, timely and effective passage for adult American eel.

Study Plan Criteria

1. The goal of this study is to assess the need for dedicated upstream passage for American eel. The objective of this study are: 1) conduct systematic surveys of eel presence/abundance below the Lower Barker Dam, 2) identify areas of concentration in pools or attempting to ascend wetted structures that would potentially establish the most effective locations to place upstream eel passage facilities and 3) collect eels with temporary trap/pass devices from areas identified from surveys as potentially viable sites for permanent eel trap/pass structures.

2. The relevant resource management goals are captured in our Next Generation Strategic Plan (NOAA 2010). Identified in this plan is the long-term goal of healthy oceans which support healthy populations of marine species and sustainable commercial and recreational fisheries. Further, our involvement supports the management objectives of the Atlantic States Marine Fisheries Commission Interstate Fishery Management Plan for American eel (ASMFC 2013) as well as our mandates under the Fish and Wildlife Coordination Act, Magnuson-Stevens Fishery Conservation and Management Act and the Endangered Species Act.

3. The requestor, the National Marine Fisheries Service, is a federal resource agency with a mandate to protect and conserve fisheries resources and associated habitat.

4. The PAD contains no information relative to areas where eels seeking to move upstream concentrate below the Lower Barker Dam, or an assessment of the numbers of eels attempting to ascend at the dam. Data from this study will provide valuable information for our decision process for this licensing action and in developing the administrative record for potential Section 18 fishway prescriptions and/or Section 10(j) recommendations.

5. Dams are not inherently amenable to safe, timely and effective passage of eels. The passability of a dam depends on factors such as its height, hydraulics, presence of climbable surfaces (e.g., rough surface, wetted substrate), presence of predators, and risk of exposure to heat or drying while climbing a dam among others (Solomon and Beach 2004). Passage is also limited by the size of eel present. Only small juvenile eels are able to scale vertical surfaces (FPLE 2004; Machut et.al. 2007). The Lower Barker Project includes a 30 foot high and 232 foot long spillway dam with a non-overflow section, and other features prone to leakage. The Project includes a 2850 foot long bypass section with the tailwater (elevation = 115.6 feet NAVD 88) approximately 49 feet lower than headpond (elevation = 164.7 feet NAVD 88). This design, similar to most dams, creates a significant barrier to passage and multiple potential sites for upstream migrating eels to congregate. Site specific data are necessary to understand

project effects and support the decision process for properly designing and siting eel passage facilities.

6. This study request consists of two parts: (a) an initial survey for presence and identification of areas where juvenile eels congregate and (b) a site evaluation for permanent eel passage. The methodologies described here are consistent with commonly accepted practices.

    a. Surveys of eel presence and relative abundance should be conducted at regular intervals throughout the eel upstream migratory season (Approximately April 1 to November 30). Surveys should consist of visual inspection and trapping in likely areas where eels may concentrate. Areas of quiescent water and leakage points along the downstream face of the dams should be targeted. Methods should include visual surveys (on foot, from a boat, or snorkeling) and trapping using small mesh (< 1/8" clear opening) baited eel pots. Visual surveys should be performed once per week, at night, preferentially during precipitation events. Trap sets should be performed once per week, with an overnight soak time. Recorded data should include location, observation of eels (presence, absence, relative numbers, relative sizes, behaviors, time/date of observation), and survey method.

    b. Areas identified from the surveys as having significant number of eels present should be targeted as potential areas for permanent eel trap/passes, and should be initially assessed using temporary/portable trap passes. Temporary trap/passes should be purpose-designed and built for each location, and operated throughout the eel upstream migratory season in the year following the survey. Ramp-type traps with supplementary attraction flow are preferred temporary trap/pass designs (Solomon and Beach 2004). Traps should operate daily, with catches quantified every 2-3 days. Recorded data should include location, trapping interval, absolute numbers of eels trapped, relative eel sizes, and hydraulic and environmental conditions during the trapping period.

7. The level of cost and effort for the survey component of the study would be low; a minimal number of personnel may be able to conduct the weekly or bimonthly surveys. The trap/pass component would require low to moderate cost and effort. We are not aware of any specifically proposed studies related to upstream eel passage to date.

2.4 Downstream Fish Passage Effectiveness and Survival: Behavior, Entrainment and Impingement at the Intake.

Impacts on migratory fish resulting from hydroelectric projects and the need for mitigation measures are well established (FERC 2004). As noted in the PAD, American eel are present in the Project area and the State of Maine currently stocks alewife into several lakes above

the Lower Barker Project. Downstream passage at the Lower Barker Project consists of a stoplog section of the spill way and minimum flows for the purposes of downstream passage. Based on the information before us, this method of downstream passage has not been evaluated for efficiency and survival. The purpose of this study request is to evaluate the existing downstream passage facility and assess turbine entrainment and impingement impacts at the Lower Barker Project. Data from this study will be used to determine the need for additional mitigation measures to avoid and minimize project related impacts to downstream migrating diadromous fish.

Study Plan Criteria

1. The goal of the study is to evaluate: 1) behavior of outmigrating diadromous species at the Project intakes; 2) the potential level of entrainment and impingement at the Project intakes; 3) the survival of fish through the downstream fish bypass; and 4) the effects on the quality of fisheries resources in the Lower Barker Project. The objectives of this study are to describe: 1) the physical characteristics of the intake structure including its location and dimensions, the velocity distribution in front of the intake structure, the presence of any trashracks or screens, and if present, the size of the clear spacing between bars; 2) identify downstream migration route selection for adult and juvenile migrants; 3) assess the relative abundance, timing, and species composition of fishes entrained, impinged, or otherwise affected by the intake structure; 4) describe the effects of project induced entrainment or impingement on the fish resources (injury and mortality); 5) assess the survival of fish through the downstream fish bypass; and 6) evaluate the need for measures to minimize and mitigate potential impacts associated with project operations.

2. The relevant resource management goals are captured in our Next Generation Strategic Plan (NOAA 2010). Identified in this plan is the long-term goal of healthy oceans which support healthy populations of marine species and sustainable commercial and recreational fisheries. Further, our involvement supports the management objectives of the Atlantic States Marine Fisheries Commission Interstate Fishery Management Plan for Shad and River Herring (ASMFC 2009) and for American eel (ASMFC 2013) as well as our mandates under the Fish and Wildlife Coordination Act, Magnuson-Stevens Fishery Conservation and Management Act and the Endangered Species Act.

3. The requestor, the National Marine Fisheries Service, is a federal resource agency with a mandate to protect and conserve fisheries resources and associated habitat.

4. Existing information pertaining to a downstream assessment includes (a) the State of Maine stocks adult alewife in spawning habitat upstream of the Project, (b) the Project includes measures intended to protect outmigrating juveniles and adult diadromous fish and (c) hydroelectric projects directly and indirectly impact fisheries resources. Information in the PAD was not sufficient to evaluate the potential for project induced

entrainment or impingement of fish at the Project's intake. Results of this study request will provide information regarding fish behavior at the intakes, entrainment and impingement impacts at the Project intakes and inform the consultation process for developing appropriate downstream fish passage and protection measures.

5. Fish that occupy the Lower Barker Project impoundment, including diadromous species, are susceptible to impingement on trashracks or entrainment through the Project's turbine during generation. This is a direct project related impact. The PAD does not include data or a discussion evaluating the potential extent of those impacts. Evaluation of the fish behavior and potential for entrainment and impingement impacts is needed to inform a decision on the need for downstream fish passage and protection measures in the license and contribute to an administrative record for potential Section 18 fishway prescriptions.

6. A number of different field methods could be used to survey for fish and fish behavior at the intake structure. These methods are well-established and include: full draft tube netting, use of variable mesh gill nets, hydroacoustic monitoring, deploying camera systems or the use of PIT or radio-tags. These methods have been used successfully in other Commission licensing proceedings. Measurements of single point velocities on a two foot by two foot grid measured six inches upstream and across the front of trashracks should be taken with a portable velocity meter or acoustic doppler current profiler or comparable method. It is important to note that a desktop analysis would not meet the goal of this study request. A desktop analysis based on studies at comparable projects and allometrically similar fish has value for projects without existing mitigation measures. Under certain circumstances, such an analysis can inform the decision process. However, for the current licensing process, where an untested downstream passage facility is in place, site specific data using field methods described above is appropriate. We are specifically seeking to understand the function of the existing downstream passage mitigation measures.

7. Field work would be required to collect data on the species potentially impinged and entrained, studying the behavior of fish at the stoplog section and the intake, and obtaining water velocity data. The seasonal nature of this study will require at least one full year to complete. A second season may be necessary depending on the outcome of the first year. The level of effort and cost of the requested study is commensurate with a project the size of the Lower Barker facility and the likely license term. No alternatives have been proposed.

2.5 Bypass Reach In-stream Flow Study

The Lower Barker Project bypasses approximately 0.5 miles of low-gradient riverine habitat below the dam (i.e., bypass reach). A minimum flow of 20 cfs is provided to maintain aquatic habitats in this reach during non-spill periods. All flows less than 170 cfs (minimum hydraulic

capacity plus minimum flow requirement) are passed over the spillway. From June 1 through November 15, KEI (Maine) releases the minimum flow from the stoplog section, which serves as the downstream fish passage. During the remainder of the year, KEI (Maine) releases the minimum flow from one of the fixed gates (FERC 2011). Flow fluctuations affect the quality and quantity of aquatic habitat, and directly impact aquatic biota (e.g., movement, stranding, spawning and tributary access). Free-flowing reaches are very limited in this area of the Androscoggin River watershed and therefore, need to be protected for riverine species. The Maine Department of Marine Resources has identified suitable spawning habitat for Atlantic salmon within the project bypass (MDMR 2012); however, the PAD provides limited insight as to the efficacy of the minimum flow requirement for habitat quality. We recommend the applicant complete a study to assess the relationship between project discharges, minimum flows and the quantity, quality and accessibility of various habitat types for diadromous species. Data collected during this study will inform recommendations for minimum flow requirements.

Study Plan Criteria

1. The goal of this study is to determine an appropriate flow regime that will protect and enhance the aquatic resources in the bypassed reach between Lower Barker Dam and the powerhouse discharge. The objectives of this study are to 1) document downstream aquatic habitat characteristics within the reach between Lower Barker Dam and the powerhouse discharge; 2) assess the effects of Project operations on river herring and salmonid migration habitats, spawning, incubation and rearing habitats; 3) assess the effects of a range of proposed project discharges on the wetted area and optimal habitat for target species; and 4) determine minimum flows to avoid impacts to fish and associated aquatic habitat. The target fish species used to evaluate habitat value should include federally endangered Atlantic salmon.

2. The relevant resource management goals are captured in our Next Generation Strategic Plan (NOAA 2010). Identified in this plan is the long-term goal of healthy oceans which support healthy populations of marine species and sustainable commercial and recreational fisheries. Further, our involvement supports the management objectives of the Atlantic States Marine Fisheries Commission Interstate Fishery Management Plan for Shad and River Herring (ASMFC 2009) and for American eel (ASMFC 2013) as well as our mandates under the Fish and Wildlife Coordination Act, Magnuson-Stevens Fishery Conservation and Management Act and the Endangered Species Act.

3. The requestor, the National Marine Fisheries Service, is a federal resource agency with a mandate to protect and conserve fisheries resources and associated habitat.

4. The Lower Barker Project has a minimum flow requirement of 20 cfs for the Project's bypass reach to enhance fishery resources (FERC 1979). This minimum flow was adopted by the Commission because it developed in consultation with the Maine

Department of Inland Fisheries and Wildlife and other state and local officials (FERC 1979). Unfortunately, the full administrative record of the original licensing proceeding is not readily available and we are uncertain what methods constitute "field observations." We question whether the existing 20 cfs minimum flow requirement was based upon site-specific empirical data or other qualitative methods, and for which species. The PAD only provides summary flow data with no information on powerhouse discharge variability. An analysis of the flow-related impacts on aquatic habitat is needed to evaluate any potential effects of Project operation on migration, spawning, incubation, rearing and refuge habitat for ESA-listed Atlantic salmon in the Little Androscoggin River. Additionally, information in the PAD does not indicate how operations have altered downstream hydrology, habitat quantity and quality, and water quality, which may affect resident and migratory fish, macroinvertebrates, listed species, aquatic plants and other biota and natural processes in the Little Androscoggin River downstream of the Lower Barker Dam. The PAD also does not provide a detailed description of the physical or biological characteristics of the bypassed reach. An empirical study characterizing the relationship between flow and habitat in the bypassed reach for the agencies to use in determining a flow recommendation.

5. Project related flow fluctuations have a direct effect on downstream habitats and biota. The study will provide information on the magnitude and variability of flows discharged from the Lower Barker Project and the type of habitat affected by these flows. These data will inform conclusions regarding impacts to fish (e.g., movement, stranding, and spawning) downstream of the project and whether modifications to project operations are needed. Data derived from this study will facilitate evaluation of the extent of impacts on fisheries resources and inform the development of protection and enhancement opportunities including recovery goals for Atlantic salmon.

6. A bypass flow study should be conducted at the Project. Bypass flow habitat assessments are commonly employed in developing flow release protocols intended to reduce impacts or enhance habitat conditions in reaches of river bypassed by hydroelectric projects. Given the size of the bypassed reach (0.5 miles long) and the important resources known to inhabit the reach (i.e., federally endangered Atlantic salmon and other diadromous fishes), we believe a study methodology that uses an Instream Flow Incremental Methodogy (IFIM) approach is appropriate for this site. This same protocol has been accepted by the Commission in other licensing proceedings.

   At a minimum, the study design should involve collecting wetted perimeter, depth, velocity, and substrate data within a range of discharge levels along transects located in the reach of river between the dam and the powerhouse. The measurements should be taken over a range of test flows. Transects must be located on-site in consultation with the resource agencies. This information then should be synthesized to quantify habitat

suitability (using mutually agreed upon Habitat Suitability Index curves) of each test flow for target species/life stages identified by the fisheries agencies. Habitat modeling using standard Physical Habitat Simulation System, one dimensional modeling is acceptable for the bypassed reach from the area downstream the dam to its confluence with the Androscoggin River.

7. This work will require compiling flow data (Lower Barker Project discharge data and variability) and at least one field season to conduct habitat mapping and IFIM studies. The level of effort and cost is commensurate with a project the size of the Lower Barker facility and the likely license term. KEI (Maine) proposes to conduct a qualitative bypass reach habitat assessment to determine the effects of project operations and the adequacy of the minimum flow. No further details of this study were provided in the PAD. It is our position that a quantitative assessment, as described in our study request, will better inform the licensing decision process by providing data that can be assessed using best available science.

2.6 Flow Duration Curve Assessment

Published studies project shifting hydroclimatic and hydrologic conditions for New England streams and rivers over the next century as a result of climate change (Huntington et al. 2009, Horton et al. 2014; Melillo et al. 2014). These projected shifts include more intense precipitation events at greater frequency and an increased potential for drought-like conditions. Studies also indicate distinct trends in increasing flood risk since the early 1970's (Collins 2009; Douglas and Fairbank 2011; Armstrong et al. 2012). In brief, seasonal flow conditions observed in the Northeast during the past 50 - 80 years were stable. That relative stability is no longer the norm. The studies cited above indicate a changing baseline flow condition throughout the northeast such that extreme high and low flow conditions are more prevalent. Climate change and the resultant changes in baseline environmental conditions during the next 30-50 years will influence project operations, scope and scale of project related impacts environmental impacts and the effectiveness of mitigation measures (e.g., fish passage). Data from this study can be used to inform the licensing process with specific application to fish passage needs.

Study Plan Criteria

1. The goal of the study is to evaluate changes in the flow duration curve for the Little Androscoggin River. The objectives of this study are to: 1) determine if flow pattern changes consistent with other studies are observable for the Little Androscoggin River; 2) if flow pattern changes are observable, determine which time period of data within the USGS gauge is appropriate for use during the licensing proceedings; and (3) use the appropriate data to inform the development of climate resilient license articles.

2. Diadromous fish can access the Lower Barker Dam. We anticipate fish passage to be a

requirement of any new license issued by you for the Lower Barker Project. River flow, including extreme high and low conditions, is a critical component of the fishway design process. The relevant resource management goals are captured in our Next Generation Strategic Plan (NOAA 2010). Identified in this plan are the long-term goals of climate adaptation and mitigation and healthy oceans. Further, our involvement supports the management objectives of the Atlantic States Marine Fisheries Commission Interstate Fishery Management Plan for Shad and River Herring (ASMFC 2009) and for American eel (ASMFC 2013) as well as our mandates under the Fish and Wildlife Coordination Act, Magnuson-Stevens Fishery Conservation and Management Act and the Endangered Species Act.

3. The requestor, the National Marine Fisheries Service, is a federal resource agency with a mandate to protect and conserve fisheries resources and associated habitat.

4. The existing flow duration curve relies on methods develop prior to our understanding of climate change and, more specifically, implications of climate change on the northeast. As such, the resultant data anticipated through this study request does not exist.

5. River flow and its seasonal patterns directly influence project operations and mitigation measures intended to avoid and minimize project impacts. As flow patterns change, changes in project operations often occur. Likewise, project operations influence the behavior of migrating diadromous fish within the Project area. The information collected by this study would support the analysis of direct and cumulative effects of the Project on migratory fish and aid in the development of any necessary license articles regarding measures to achieve fish passage.

6. Studies should utilize current literature, existing data from the USGS gage on the Little Androscoggin River (USGS No. 01057000) and standard practices accepted by the scientific community.

7. We anticipate all the data necessary are available. The analysis could be completed within months. The level of effort and cost is commensurate with a project the size of the Lower Barker facility and the likely license term. No alternatives have been proposed.

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July 18, 2014

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, DC 20426

SUBMITTED ELECTRONICALLY

RE: Comments on the Pre-Application Document and Submission of Study Requests for the Lower Barker Project, FERC No. 2808, Kennebec County, Maine

Dear Secretary Bose:

The U.S. Fish and Wildlife Service (Service) has reviewed the Federal Energy Regulatory Commission's (Commission) March 19, 2014 Notice of Intent to File License Application, the Pre-Application Document and Approving use of the Traditional Licensing Process for the relicensing of the Lower Barker Hydroelectric Project (Project), located in Androscoggin County, Maine. The owner and operator of the Lower Barker Project is KEI Power Management LLC (Licensee). The Commission issued the Licensee a license to operate the Lower Barker Project by Order dated February 23, 1979. The license is for a period effective February 1, 1979 and terminating February 1, 2019. The Licensee will file its application for a new license on or before January 31, 2017.

The Lower Barker Project is located on the Little Androscoggin River just upstream from the confluence with the Androscoggin River. The project consists of a 16.5 acre impoundment with negligible storage capacity, an existing dam and powerhouse containing one 1,200 kilowatt generating unit, and an approximately 2,850 feet long bypass reach comprised primarily of cobble substrate.

The Project's dam is a 232 foot long concrete Amberson pier and buttress style structure. The dam consists of a 46 foot long non-overflow section that has two waste gates along the left buttress; a 125 foot long spillway topped by 14-inch high flashboards; a 61 foot long non-overflow section of the dam adjacent to the power canal with seven stop-log sections. There is an intake canal and gatehouse structure that controls the flow of water into the 780 foot long concrete buried penstock leading to the powerhouse. The turbine-generating unit has a maximum hydraulic capacity of 500 cubic feet per second and a minimum hydraulic capacity of 150 cubic feet per second.

The Lower Barker Project is located within the range of the Gulf of Maine Distinct Population Segment of Atlantic salmon which is listed as endangered under the Endangered Species Act and has the potential to affect the species. Atlantic salmon are known to migrate to waters downstream of the Project and potentially use the bypass reach. Therefore, potential impacts to the listed Atlantic salmon as a result of Project operations must be addressed within the context of this licensing proceeding. The Little Androscoggin River watershed is also managed by the State of Maine for American eel and river herring.

The Service submits the following comments and recommendations under the authority of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 *et seq.),* the Fish and Wildlife Coordination Act (48 Stat. 401, as amended, 16 U.S.C. § 661 *et seq.),* and the Federal Power Act (FPA) (16 U.S.C. § 791a, *et seq.).*

U.S. FISH AND WILDLIFE SERVICE GOALS AND OBJECTIVES

We seek to accomplish several fish and wildlife resource goals and objectives through the Lower Barker Project's re-licensing process. The Service's general re-licensing goals are to:

1. Ensure that protection, mitigation and enhancement measures are commensurate with the Project's effects and contribute to meeting state and federal fish and wildlife objectives;

2. Recover federally proposed and listed species and prevent the listing of additional species;

3. Conserve, protect, and enhance the habitats for fish, wildlife, and plants that continue to be affected by the Project;

4. Ensure that once the licensing process is complete, there is an adaptive management plan to incorporate new information and implement new management strategies over the term of the license, bringing us closer to the desired level of protection for fish and wildlife resources.

Objectives for Aquatic Ecosystems

Our specific objectives for aquatic ecosystems, terrestrial resources and threatened and endangered species are to:

1. Protect, enhance, or restore diverse high quality aquatic and riparian habitats for plants, animals, food webs, and communities in the watershed and mitigate for loss or degradation of these habitats;

2. Maintain and/or restore aquatic habitat connectivity in the watershed to provide movement, migration, and dispersal corridors for salmonids, resident fish and other aquatic organisms and provide longitudinal connectivity for nutrient cycling processes;

3. Restore naturally reproducing stocks of endangered Atlantic salmon, as well as other salmonids, migratory fish and resident fish, to historically accessible riverine and lake habitats;

4. Provide an instream flow regime that meets the spawning, incubation, rearing, and migration requirements of salmonids and other resident fish and amphibian species, throughout the Project area, and for diadromous fish in downstream waters of the Little Androscoggin and Androscoggin Rivers that may be affected by the Project's water management releases;

5. Meet or exceed Federal and State regulatory standards and objectives for water quality in the basin;

6. Minimize Project operation effects on water temperature and the potential negative effects to downstream fishery resources;

Objectives for Terrestrial Resources

7. Reduce the effect of the fluctuation zone on wildlife habitat and seek opportunities to enhance this habitat;

Objectives for Endangered, Threatened, Proposed and Sensitive Species

8. Reduce Project effects on state and federal threatened, endangered, proposed and sensitive species; and

9. Explore opportunities for potential protection, mitigation and enhancement measures for threatened, endangered, and proposed species.

Our comments and study requests are intended to facilitate the collection of information necessary to conduct effects analyses and to develop conservation measures, reasonable and prudent measures, prescriptions, and protection, mitigation, and enhancement measures pursuant to the Service's authorities under the Endangered Species Act, the Fish and Wildlife Coordination Act and the Federal Power Act.

COMMENTS ON THE PRE-APPLICATION DOCUMENT

The Service appreciates the Licensees' effort to prepare the pre-application document which provides existing and relevant information intended to enable participants in the relicensing proceeding to identify issues and related information needs and to develop study requests. We provide the following specific comments to raise awareness of particular issues, and to facilitate future collaborative discussions with the Commission and the Licensee in the development of studies.

Section 3.1. This section provides summary data on the Lower Barker Project's flow data from U.S. Geological Survey gaging station at South Paris on the Little Androscoggin River (No. 01057000). Recent studies predict changing weather patterns in Maine that will produce more intense episodic precipitation events at greater frequency. Coupled with this will be an increased potential for drought-like conditions.[1] This will likely result in greater periods of both high flow and low flow conditions (see NOAA July 10, 2014 comments). Climatic changes and the resulting flows will influence the Project's operations, scope, and scale and could diminish the public benefit of this project.

The final National Environmental Policy Act documents used to support your decision should consider recent changes in observed precipitation events in the hydraulic model and climate change projections in establishing public benefit.

Section 4.4.2. The applicant states that the Project has a minimum low flow for the bypass reach (more than half a mile long) of 20 cubic feet per second. Article 21 of the 1979 Commission Order Issuing License sets this minimum flow "for the purpose of protecting and enhancing the fishery resources in and adjacent to the Little Androscoggin River". The methodology used to determine this minimum low flow is unclear.

In 1980 the Service released the draft New England Flow Policy for review and comment and released the Interim Regional Policy for New England Stream Flow Recommendations (Stream Flow Policy) on February 13, 1981. This Stream Flow Policy was developed due to the need for instream flow criteria to sustain indigenous aquatic organisms throughout the year and established flow recommendations at water projects in New England.

The Stream Flow Policy states:

a) Where a minimum of 25 year of U.S Geological Survey gaging records exist at or near a project site on a river that is basically free-flowing, the Service shall recommend that the Aquatic Base Flow release for all times of the year be equivalent to the median August flow for the period of record unless superseded by spawning and incubation flow recommendations. The Service shall recommend flow releases equivalent to the historical median stream flow throughout the applicable spawning and incubation periods.
b) For rivers where inadequate flow records exist or for rivers regulated by dams or upstream diversions, the Service shall recommend that the aquatic base flow release be 0.5 cubic feet per second per square mile of drainage, as derived from the average of the median August monthly records for the representative New England stream. The 0.5 cubic feet per second per square mile shall apply to all times of the year, unless superseded by spawning and incubation flow recommendations. The Service shall

[1] References

Horton, R., G. Yohe, W. Easterling, R. Kates, M. Ruth, E. Sussman, A. Whelchel, D. Wolfe, and F. Lipschultz, 2014: Ch. 16: Northeast. In *Climate Change Impacts in the United States: The Third National Climate Assessment*

U.S. Global Change Research Program, 371-395, doi:10.7930/J0SF2T3P

Melillo, Jerry M., Terese Richmond, and Gary W. Yohe, Eds., 2014: Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. Global Change Research Program, 841 pp. DOI: 10.7930/J0Z31WJ2

> recommend flow release of 1.0 cubic feet per second per square mile in the fall/winter and 4.0 cubic feet per second per square mile in the spring for the entire applicable spawning and incubation periods.

The Little Androscoggin River watershed is 352 square miles. Using the part (b) formula, the minimum aquatic base flow should be 176 cubic feet per second in the bypass reach. Habitat in this reach could prove suitable for spawning adults and outmigrating juvenile diadromous species. The bypass reach minimum flow should be re-evaluated with current management priorities in mind (see Bypass Reach Instream Flow Study).

Section 5.6. The Service and the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (together the Services) jointly listed the Gulf of Maine Distinct Population Segment of Atlantic salmon in 2009 as endangered under the Endangered Species Act. The current range of the endangered Atlantic salmon includes the Little Androscoggin River up to the project dam and powerhouse but this area was not designated as critical habitat. The overarching goal of the Endangered Species Act is to recover the species and the habitat upon which they depend. The Services expects to restore endangered Atlantic salmon to the Little Androscoggin River, which includes the Lower Barker Project area, during the term of any new license issued by the Commission.

Study Requests

We have attached study requests (see attachment) as required by 18 CFR § 5.9(b) using the guidance that the Commission has provided for requesting studies during this phase of the relicensing process.

We request the opportunity to review and provide comments on all draft study plans. In addition, the Service will play an important role in working with the Licensee to develop the studies to assess fish passage needs.

Thank you for the opportunity to comment during the early planning stages of this Project. If you have any questions regarding this response, please contact Antonio Bentivoglio by email at *Antonio_Bentivoglio@fws.gov* or by telephone at 207/866-3344 Extension 151 or at the above address.

Sincerely,

Steven L. Shepard

for
Laury Zicari
Field Supervisor

Attachment

cc: A. Tittler, DOI/SOL
K. Mendik, NPS
C. McGhee, BIA
R. Abele, EPA
B. Towler, RO/EN
S. McDermott and B. McDavitt, NOAA
K. Howatt, MDEP
G. Wippelhauser and P. Christman, MDMR
J. Perry, MDIFW
Reading File

ATTACHMENT – U.S. FISH & WILDLIFE SERVICE STUDY REQUESTS

1. Downstream Fish Passage Effectiveness and Survival
2. Bypass Reach In-stream Flow Study
3. Eel Passage Facility Design and Siting

Study 1 – Downstream Fish Passage Effectiveness and Survival

Criterion (1) – Describe the goals and objectives of each study proposal and the information to be obtained.

As noted in the pre-application document, American eel and downstream alewife migrants are present within the Project area. The current downstream fish passage facility appears inadequate as was documented by the fish kill in 2000. The purpose of this study request is to evaluate the existing downstream passage facility and assess turbine entrainment and impingement impacts.

Criterion (2) – If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resources to be studied.

The Service's authorities are the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 *et seq.),* the Fish and Wildlife Coordination Act (48 Stat. 401, as amended, 16 U.S.C. § 661 *et seq.),* and the Federal Power Act (FPA) (16 U.S.C. § 791a, *et seq.).*

The purpose of the Endangered Species Act is to conserve the ecosystem of an endangered or threatened species. The endangered Atlantic salmon in found within the boundary of this Project therefore any federal action must undergo a review under the Endangered Species Act.

Criterion (3) – If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.

Not applicable.

Criterion (4) – Describe existing information concerning the subject of the study proposal and the need for additional information.

The Service is not aware of any downstream fish passage effectiveness and survival studies at the Project and information in the pre-application document was not sufficient to evaluate downstream fish passage.

Criterion (5) – Explain any nexus between Project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.

Results of this study request will provide information regarding downstream fish passage effectiveness, turbine entrainment, and survival to determine if the existing facilities are adequate. If downstream survival is not adequate then this study should identify which aspects of overall downstream passage are inadequate so that improvements can be made.

Criterion (6) – Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.

Methods to conduct downstream bypass studies are well established and have been used successfully in other Commission licensing proceedings. These include: hydroacoustic monitoring, radio telemetry, or observations using camera systems.

Criterion (7) – Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

Field work would be required to collect data on the entrainment, intake, and obtaining water velocity data. This work is seasonal and will require at least one full year to complete. A second season may be necessary depending on the outcome of first year's results. The level of effort and cost of the requested study is commensurate with a project the size of the Lower Barker facility and the likely license terms. No alternatives have been proposed.

Study 2 – Bypass Reach In-stream Flow Study

Note: The Lower Barker Project conveys water from the impoundment through a 780-foot-long concrete buried penstock leading to the powerhouse located just upstream from the connection to the Androscoggin River. This leaves the original Little Androscoggin River channel to become the bypass reach which is approximately 0.5 miles of moderate gradient riverine habitat. A minimum flow of 20 cubic feet per second is provided to maintain aquatic habitats in this reach during periods when there is no other spill occurring. The minimum hydraulic capacity of the facility is 150 cubic feet per second. If incoming flow is less than 170 cubic feet per second (minimum hydraulic capacity plus minim flow requirements) then the full 170 cubic feet per second is passed over the spillway. Flow fluctuations affect the quality and quantity of aquatic habitat. The Maine Department of Marine Resources has identified suitable spawning habitat for Atlantic salmon within the bypass reach (MDMR 2012), however, the pre-application document provides little in regards to how the minimum flows provide adequate habitat in the bypass reach. This study is identical to the study recommended by NOAA (2.5 Bypass Reach In-stream Flow Study p.12).

Criterion (1) – Describe the goals and objectives of each study proposal and the information to be obtained.

The goal of this study is to determine an appropriate flow regime that will protect and enhance the aquatic resources in the bypass reach which includes the endangered Atlantic salmon.

Criterion (2) – If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resources to be studied.

The Service's authorities are the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 *et seq.),* the Fish and Wildlife Coordination Act (48 Stat. 401, as amended, 16 U.S.C. § 661 *et seq.),* and the Federal Power Act (FPA) (16 U.S.C. § 791a, *et seq.).*

The purpose of the Endangered Species Act is to conserve the ecosystem of an endangered or threatened species. The 2011 Atlantic Salmon Framework, the 2009 Critical Habitat Listing document, and the current draft of the Atlantic Salmon Recovery Plan underscore the importance of achieving three objectives for salmon recovery: salmon abundance, geographic distribution of salmon among watersheds, and ecosystem function/diversity. Currently, only a few endangered Atlantic salmon may be found seasonally within the boundary of the Lower Barker Project. Many more salmon are needed in the Merrymeeting Bay watershed (one of three critical habitat units) to achieve the objectives described above. Therefore any federal action, such as the relicensing of the Lower Barker Project, must undergo a review under the Endangered Species Act. The focus of such review will be upon aquatic habitats and fish passage.

Criterion (3) – If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.

Not applicable.

Criterion (4) – Describe existing information concerning the subject of the study proposal and the need for additional information.

It is unclear how the minimum flow requirement of 20 cubic feet per second for the Project's bypass reach was originally determined. Service guidelines recommend that licensees independently assess the flow releases needed by indigenous organisms, in this case migrating, spawning and rearing Atlantic salmon and migrating, spawning, and rearing alewives. Two methods to determine flow releases are presented above.

Criterion (5) – Explain any nexus between Project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.

Project related flow fluctuations in the bypass have a direct affect on downstream habitats and biota. The study will provide information on the magnitude and variability of the flows discharged from the Project and the type of habitat affected by these flows.

Criterion (6) – Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.

Instream Flow Incremental Methodology is recommended for this site. This method is used to determine the relationship between stream flows and fish habitat and this same protocol has been accepted by the Commission in other licensing proceedings. The Licensee should consult with the Service on appropriate study species/life stages and transect locations.

Criterion (7) – Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

This work will require a single field season to collect the data and develop the models to calculate how much fish habitat is gained or lost at different stream flows.

Study 3 – Eel Passage Facility Design and Siting

Criterion (1) – Describe the goals and objectives of each study proposal and the information to be obtained.

The goal of the study is to determine appropriate designs and locations for upstream and downstream eel passage facilities, and to determine their operating criteria for the Lower Barker Project.

Criterion (2) – If applicable, explain the relevant resource management goals of the agencies or Indian tribes with jurisdiction over the resources to be studied.

The Service's authorities are the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 *et seq.),* the Fish and Wildlife Coordination Act (48 Stat. 401, as amended, 16 U.S.C. § 661 *et seq.),* and the Federal Power Act (FPA) (16 U.S.C. § 791a, *et seq.).*

The purpose of the Endangered Species Act is to conserve the ecosystem of an endangered or threatened species. The endangered Atlantic salmon in found within the boundary of this Project therefore any federal action must undergo a review under the Endangered Species Act.

Criterion (3) – If the requester is not a resource agency, explain any relevant public interest considerations in regard to the proposed study.

Not applicable.

Criterion (4) – Describe existing information concerning the subject of the study proposal and the need for additional information.

The Service is not aware of any records of eel abundance and behavior at the Lower Barker Project.

Criterion (5) – Explain any nexus between Project operations and effects (direct, indirect, and/or cumulative) on the resource to be studied, and how the study results would inform the development of license requirements.

The Lower Barker Project structures block the upstream and downstream movement of American eel. Passage facilities are needed to reestablish the connection between American eel rearing and spawning habitats.

Criterion (6) – Explain how any proposed study methodology (including any preferred data collection and analysis techniques, or objectively quantified information, and a schedule including appropriate field season(s) and the duration) is consistent with generally accepted practice in the scientific community or, as appropriate, considers relevant tribal values and knowledge.

A phased approach is needed for the design and implementation of American eel passage. An initial field study of eel abundance and behavior at the downstream face of the powerhouse and spillway should be conducted to inform fishway location and design decisions. This would be followed by upstream fishway final design and construction. Finally, an adaptive approach would be developed to monitor and refine the facilities and their operation. Downstream passage would be required at a later date, depending on upstream passage success.

Criterion (7) – Describe considerations of level of effort and cost, as applicable, and why any proposed alternative studies would not be sufficient to meet the stated information needs.

Field work would be required to inform the fishway design and location. This would be a low level of effort that may span one or two field seasons, depending on eel abundance.

APPENDIX C

MDEP BENTHIC INVERTEBRATE CLASSIFICATION MODEL RESULTS

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Classification Attainment Report

Station Information

Station Number: S-1082
Waterbody: Little Androscoggin River - Station 1082
Town: Auburn
Directions: 850 FT BELOW THE LOWER BARKER DAM

River Basin: Androscoggin
HUC8 Name: Lower Androscoggin
Latitude: 44 5 20.5 N
Longitude: 70 13 40.58 W
Stream Order: 4

Sample Information

Log Number: 2428 Type of Sample: ROCK BAG Date Deployed: 7/22/2015
Subsample Factor: X1 Replicates: 3 Date Retrieved: 8/18/2015

Classification Attainment

Statutory Class: C **Final Determination: A** Date: 4/20/2016
Model Result with P≥0.6: A **Reason for Determination: Model**
Date Last Calculated: 4/12/2016 Comments:

Model Probabilities

First Stage Model			
Class A	0.82	Class C	0.00
Class B	0.17	NA	0.00

C or Better Model	
Class A, B, or C	1.00
Non-Attainment	0.00

B or Better Model	
Class A or B	1.00
Class C or Non-Attainment	0.00

A Model	
Class A	0.97
Class B or C or Non-Attainment	0.03

Model Variables

01 Total Mean Abundance	255.33
02 Generic Richness	33.00
03 Plecoptera Mean Abundance	5.67
04 Ephemeroptera Mean Abundance	89.33
05 Shannon-Wiener Generic Diversity	3.77
06 Hilsenhoff Biotic Index	3.43
07 Relative Abundance - Chironomidae	0.02
08 Relative Generic Richness Diptera	0.21
09 *Hydropsyche* Abundance	14.00
11 *Cheumatopsyche* Abundance	17.67
12 EPT Generic Richness/ Diptera Generic Richness	3.00
13 Relative Abundance - Oligochaeta	0.00
15 Perlidae Mean Abundance (Family Functional Group)	5.67
16 Tanypodinae Mean Abundance (Family Functional Group)	0.00
17 Chironomini Abundance (Family Functional Group)	2.49
18 Relative Abundance Ephemeroptera	0.35
19 EPT Generic Richness	21.00
21 Sum of Abundances: *Dicrotendipes, Micropsectra, Parachironomus, Helobdella*	0.00
23 Relative Generic Richness- Plecoptera	0.09
25 Sum of Abundances: *Cheumatopsyche, Cricotopus, Tanytarsus, Ablabesmyia*	17.67
26 Sum of Abundances: *Acroneuria, Maccaffertium, Stenonema*	29.09
28 EP Generic Richness/14	0.86
30 Presence of Class A Indicator Taxa/7	0.14

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	*Chimarra*	19.19
2	Planariidae	16.19
3	*Plauditus*	12.01
4	*Procloeon*	9.01
5	*Cheumatopsyche*	6.92

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Classification Attainment Report

Station Number: **S-1082** Town: Auburn Date Deployed: 7/22/2015
Log Number: **2428** Waterbody: Little Androscoggin River - Station 1082 Date Retrieved: 8/18/2015

Sample Collection and Processing Information

Sampling Organization: MOODY MOUNTAIN ENVIRONMENTAL

Taxonomist: PAUL LEEPER (MOODY MOUNTAIN ENV

Waterbody Information - Deployment		Waterbody Information - Retrieval	
Temperature:	22.8 deg C	Temperature:	24.5 deg C
Dissolved Oxygen:	8.5 mg/l	Dissolved Oxygen:	8 mg/l
Dissolved Oxygen Saturation:		Dissolved Oxygen Saturation:	
Specific Conductance:		Specific Conductance:	
Velocity:	64 cm/s	Velocity:	46 cm/s
pH:		pH:	
Wetted Width:	18 m	Wetted Width:	
Bankfull Width:		Bankfull Width:	
Depth:	43 cm	Depth:	43 cm

Water Chemistry

Summary of Habitat Characteristics

Landuse Name	Canopy Cover	Terrain	
Swamp Hardwood	Partly Open	Rolling	
Urban			
Potential Stressor	**Location**	**Substrate**	
Regulated Flows	Below Dam	Boulder	10 %
		Gravel	10 %
		Rubble/Cobble	80 %

Landcover Summary - 2004 Data

Sample Comments

Maine Department of Environmental Protection
Biological Monitoring Program

Aquatic Life Taxonomic Inventory Report

Station Number: S-1082 Waterbody: Little Androscoggin River - Station 1082 Town: Auburn

Log Number: 2428 Subsample Factor: X1 Replicates: 3 Calculated: 4/12/2016

Taxon	Maine Taxonomic Code	Count (Mean of Samplers) Actual	Count (Mean of Samplers) Adjusted	Hilsenhoff Biotic Index	Functional Feeding Group	Relative Abundance % Actual	Relative Abundance % Adjusted
Planariidae	03010101	41.33	41.33		--	16.2	16.2
Orconectes	09010301008		0.67		CG		0.3
Orconectes limosus	09010301008013	0.67			--	0.3	
Acroneuria	09020209042	3.67	3.67	0	PR	1.4	1.4
Perlesta	09020209046	0.67	0.67	5	PR	0.3	0.3
Agnetina	09020209050	1.33	1.33	2	PR	0.5	0.5
Procloeon	09020401010	23.00	23.00		CG	9.0	9.0
Plauditus	09020401012	30.67	30.67		CG	12.0	12.0
Heptageniidae	09020402	9.33			--	3.7	
Stenacron	09020402014	2.67	3.91	7	SC	1.0	1.5
Maccaffertium	09020402015	12.00	17.60	4	SC	4.7	6.9
Stenonema	09020402016	5.33	7.82	4	SC	2.1	3.1
Isonychia	09020404018	0.67	0.67	2	CF	0.3	0.3
Ephemerella	09020410035	3.33	3.33	1	CG	1.3	1.3
Eurylophella	09020410036	1.33	1.33	3	CG	0.5	0.5
Caenis	09020412040	1.00	1.00	7	CG	0.4	0.4
Chimarra	09020601003	49.00	49.00	2	CF	19.2	19.2
Neureclipsis	09020603008	1.00	1.00	7	CF	0.4	0.4
Cheumatopsyche	09020604015	17.67	17.67	5	CF	6.9	6.9
Hydropsyche	09020604016	14.00	14.00	4	CF	5.5	5.5
Macrostemum	09020604018	5.00	5.00	3	CF	2.0	2.0
Rhyacophila	09020605019	0.67	0.67	2	PR	0.3	0.3
Micrasema	09020609044	0.67	0.67	2	SH	0.3	0.3
Lepidostoma	09020611064	0.67	0.67	1	SH	0.3	0.3
Oecetis	09020618078	1.00	1.00	8	PR	0.4	0.4
Chironomidae	09021011	0.33			--	0.1	
Eukiefferiella	09021011041	0.33	0.36	8	CG	0.1	0.1
Rheotanytarsus	09021011072	2.33	2.49	6	CF	0.9	1.0
Endochironomus	09021011087	0.33	0.36	10	SH	0.1	0.1
Microtendipes	09021011094	0.67	0.71	6	CF	0.3	0.3
Polypedilum	09021011102	1.00	1.07	6	SH	0.4	0.4
Stenochironomus	09021011105	0.33	0.36	5	CG	0.1	0.1
Simulium	09021012047	14.67	14.67	4	CF	5.7	5.7
Psephenus	09021108058	3.00	3.00	4	SC	1.2	1.2
Elmidae	09021113	0.67			--	0.3	
Microcylloepus	09021113066	4.33	4.91	3	--	1.7	1.9
Promoresia	09021113069	0.67	0.76		--	0.3	0.3

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Classification Attainment Report

Station Information

Station Number: S-1083
Waterbody: Little Androscoggin River - Station 1083
Town: Auburn
Directions: 1750 FT DOWNSTREAM OF DAM, ~400 FT DOWNSTREAM OF POWERHOUSE

River Basin: Androscoggin
HUC8 Name: Lower Androscoggin
Latitude: 44 5 18.06 N
Longitude: 70 13 29.32 W
Stream Order: 4

Sample Information

Log Number: 2429 Type of Sample: ROCK BAG Date Deployed: 7/22/2015
Subsample Factor: X1 Replicates: 3 Date Retrieved: 8/18/2015

Classification Attainment

Statutory Class: C **Final Determination: A** Date: 4/20/2016
Model Result with P≥0.6: A **Reason for Determination: Model**
Date Last Calculated: 4/12/2016 Comments:

Model Probabilities

First Stage Model			
Class A	0.63	Class C	0.02
Class B	0.36	NA	0.00

C or Better Model	
Class A, B, or C	1.00
Non-Attainment	0.00

B or Better Model	
Class A or B	1.00
Class C or Non-Attainment	0.00

A Model	
Class A	0.71
Class B or C or Non-Attainment	0.29

Model Variables

01 Total Mean Abundance	334.00
02 Generic Richness	31.00
03 Plecoptera Mean Abundance	3.67
04 Ephemeroptera Mean Abundance	96.00
05 Shannon-Wiener Generic Diversity	3.71
06 Hilsenhoff Biotic Index	3.87
07 Relative Abundance - Chironomidae	0.03
08 Relative Generic Richness Diptera	0.13
09 *Hydropsyche* Abundance	62.00
11 *Cheumatopsyche* Abundance	34.67
12 EPT Generic Richness/ Diptera Generic Richness	5.00
13 Relative Abundance - Oligochaeta	0.00
15 Perlidae Mean Abundance (Family Functional Group)	3.67
16 Tanypodinae Mean Abundance (Family Functional Group)	0.00
17 Chironomini Abundance (Family Functional Group)	5.67
18 Relative Abundance Ephemeroptera	0.29
19 EPT Generic Richness	20.00
21 Sum of Abundances: *Dicrotendipes, Micropsectra, Parachironomus, Helobdella*	0.00
23 Relative Generic Richness- Plecoptera	0.06
25 Sum of Abundances: *Cheumatopsyche, Cricotopus, Tanytarsus, Ablabesmyia*	34.67
26 Sum of Abundances: *Acroneuria, Maccaffertium, Stenonema*	62.80
28 EP Generic Richness/14	0.71
30 Presence of Class A Indicator Taxa/7	0.14

Five Most Dominant Taxa

Rank	Taxon Name	Percent
1	*Hydropsyche*	18.56
2	*Macrostemum*	14.07
3	*Cheumatopsyche*	10.38
4	*Chimarra*	10.18
5	*Maccaffertium*	9.18
6	*Stenonema*	9.18

Maine Department of Environmental Protection
Biological Monitoring Program
Aquatic Life Classification Attainment Report

Station Number: S-1083 Town: Auburn Date Deployed: 7/22/2015
Log Number: 2429 Waterbody: Little Androscoggin River - Station 1083 Date Retrieved: 8/18/2015

Sample Collection and Processing Information

Sampling Organization: MOODY MOUNTAIN ENVIRONMENTAL

Taxonomist: PAUL LEEPER (MOODY MOUNTAIN ENV

Waterbody Information - Deployment		Waterbody Information - Retrieval	
Temperature:	23 deg C	Temperature:	24.3 deg C
Dissolved Oxygen:	8.5 mg/l	Dissolved Oxygen:	8.3 mg/l
Dissolved Oxygen Saturation:		Dissolved Oxygen Saturation:	
Specific Conductance:		Specific Conductance:	
Velocity:	55 cm/s	Velocity:	61 cm/s
pH:		pH:	
Wetted Width:	24 m	Wetted Width:	
Bankfull Width:		Bankfull Width:	
Depth:	55 cm	Depth:	64 cm

Water Chemistry

Summary of Habitat Characteristics

Landuse Name	Canopy Cover	Terrain	
Swamp Hardwood	Open	Rolling	
Urban			
Potential Stressor	**Location**	**Substrate**	
Regulated Flows	Below Dam	Boulder	30 %
		Gravel	10 %
		Rubble/Cobble	60 %

Landcover Summary - 2004 Data

Sample Comments

Maine Department of Environmental Protection
Biological Monitoring Program

Aquatic Life Taxonomic Inventory Report

Station Number: S-1083 Waterbody: Little Androscoggin River - Station 1083 Town: Auburn

Log Number: 2429 Subsample Factor: X1 Replicates: 3 Calculated: 4/12/2016

Taxon	Maine Taxonomic Code	Count (Mean of Samplers)		Hilsenhoff Biotic Index	Functional Feeding Group	Relative Abundance %	
		Actual	Adjusted			Actual	Adjusted
Planariidae	03010101	1.67	1.67		--	0.5	0.5
Perlidae	09020209	0.33			--	0.1	
Acroneuria	09020209042	1.33	1.47	0	PR	0.4	0.4
Agnetina	09020209050	2.00	2.20	2	PR	0.6	0.7
Baetidae	09020401	3.33	3.33		--	1.0	1.0
Plauditus	09020401012	22.00	22.00		CG	6.6	6.6
Heptageniidae	09020402	26.00			--	7.8	
Maccaffertium	09020402015	17.67	30.67	4	SC	5.3	9.2
Stenonema	09020402016	17.67	30.67	4	SC	5.3	9.2
Isonychia	09020404018	8.00	8.00	2	CF	2.4	2.4
Ephemerella	09020410035	0.33	0.33	1	CG	0.1	0.1
Serratella	09020410037	0.67	0.67	2	CG	0.2	0.2
Caenis	09020412040	0.33	0.33	7	CG	0.1	0.1
Chimarra	09020601003	34.00	34.00	2	CF	10.2	10.2
Neureclipsis	09020603008	13.33	13.33	7	CF	4.0	4.0
Polycentropus	09020603010	0.33	0.33	6	PR	0.1	0.1
Cheumatopsyche	09020604015	34.67	34.67	5	CF	10.4	10.4
Hydropsyche	09020604016	62.00	62.00	4	CF	18.6	18.6
Macrostemum	09020604018	47.00	47.00	3	CF	14.1	14.1
Rhyacophila	09020605019	0.33	0.33	2	PR	0.1	0.1
Lepidostoma	09020611064	1.00	1.00	1	SH	0.3	0.3
Ceraclea	09020618072	0.67	0.67	3	CG	0.2	0.2
Oecetis	09020618078	1.00	1.00	8	PR	0.3	0.3
Corydalus	09020701002	0.33	0.33	6	PR	0.1	0.1
Rheotanytarsus	09021011072	5.33	5.33	6	CF	1.6	1.6
Microtendipes	09021011094	0.67	0.67	6	CF	0.2	0.2
Polypedilum	09021011102	5.00	5.00	6	SH	1.5	1.5
Simulium	09021012047	11.33	11.33	4	CF	3.4	3.4
Psephenus	09021108058	2.00	2.00	4	SC	0.6	0.6
Microcylloepus	09021113066	0.33	0.33	3	--	0.1	0.1
Promoresia	09021113069	6.00	6.00		--	1.8	1.8
Stenelmis	09021113070	6.67	6.67	5	SC	2.0	2.0
Hydrobiidae	10010104	0.67	0.67		--	0.2	0.2

APPENDIX D

RECORD OF CONSULTATION
FOR
FLOW STUDY LOGISTICS

Jesse Wechsler

From: Jesse Wechsler
Sent: Wednesday, June 17, 2015 10:34 AM
To: 'kathy.howatt@maine.gov'; 'Wippelhauser, Gail'; 'John.Perry@maine.gov'; Antonio Bentivoglio; 'William.McDavitt@noaa.gov'; 'Sean McDermott - NOAA Federal'; 'francis.brautigam@maine.gov'; jason.seiders@maine.gov
Cc: Loon, Lewis; Loon, Sherri; Rachel Russo; Kelly Maloney; Brandon Kulik
Subject: habitat mapping - Lower Barker and American Tissue hydroelectric projects

Good morning folks -

Instream flow studies are planned this summer as part of the relicensing of the Lower Barker and American Tissue Hydroelectric Projects. Phase 1 is to map aquatic habitat in both bypass reaches. Following the surveys, we will summarize the results and provide a memo to the stakeholders. We will develop the final details (e.g., transect locations) for Phase 2 of the studies in consultation with you following the habitat mapping efforts.

Weather permitting, we are planning to do the habitat mapping during the last week in June/first week in July (June 30 – July 3).

Let me know if you are interested in taking part and your availability that week, and we will schedule accordingly.

Thank you,
Jesse

Jesse Wechsler
Senior Fisheries Scientist
207.487.3328, Ext. 278
www.KleinschmidtGroup.com

Jesse Wechsler

From: Brautigam, Francis <Francis.Brautigam@maine.gov>
Sent: Wednesday, June 17, 2015 3:05 PM
To: Jesse Wechsler; Howatt, Kathy; Wippelhauser, Gail; Perry, John; Antonio Bentivoglio; 'William.McDavitt@noaa.gov'; 'Sean McDermott - NOAA Federal'; jason.seiders@maine.gov
Cc: Loon, Lewis; Loon, Sherri; Rachel Russo; Kelly Maloney; Brandon Kulik; Pellerin, James; Perry, John
Subject: RE: habitat mapping - Lower Barker and American Tissue hydroelectric projects

Jesse,

Please let me know when your mapping work is scheduled and if available Jim Pellerin or myself may attend. Francis

From: Jesse Wechsler [mailto:Jesse.Wechsler@KleinschmidtGroup.com]
Sent: Wednesday, June 17, 2015 10:34 AM
To: Howatt, Kathy; Wippelhauser, Gail; Perry, John; Antonio Bentivoglio; 'William.McDavitt@noaa.gov'; 'Sean McDermott - NOAA Federal'; Brautigam, Francis; jason.seiders@maine.gov
Cc: Loon, Lewis; Loon, Sherri; Rachel Russo; Kelly Maloney; Brandon Kulik
Subject: habitat mapping - Lower Barker and American Tissue hydroelectric projects

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Let me know if you are interested in taking part and your availability that week, and we will schedule accordingly.

Thank you,
Jesse

Jesse Wechsler
Senior Fisheries Scientist
207.487.3328, Ext. 278
www.KleinschmidtGroup.com

Jesse Wechsler

From: Wippelhauser, Gail <Gail.Wippelhauser@maine.gov>
Sent: Wednesday, June 24, 2015 12:58 PM
To: Jesse Wechsler
Subject: RE: habitat mapping - Lower Barker and American Tissue hydroelectric projects

I am interested in taking part and am FREE all days!!!!

Gail Wippelhauser, Ph. D.
Marine Resources Scientist
Maine Department of Marine Resources
#172 State House Station
Augusta, ME 04333

Phone: 207-624-6349 Fax: 207-624-6501
email: gail.wippelhauser@maine.gov

From: Jesse Wechsler [mailto:Jesse.Wechsler@KleinschmidtGroup.com]
Sent: Wednesday, June 17, 2015 10:34 AM
To: Howatt, Kathy; Wippelhauser, Gail; Perry, John; Antonio Bentivoglio; 'William.McDavitt@noaa.gov'; 'Sean McDermott - NOAA Federal'; Brautigam, Francis; jason.seiders@maine.gov
Cc: Loon, Lewis; Loon, Sherri; Rachel Russo; Kelly Maloney; Brandon Kulik
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Thank you,
Jesse

Jesse Wechsler
Senior Fisheries Scientist
207.487.3328, Ext. 278
www.KleinschmidtGroup.com

Jesse Wechsler

From: Jesse Wechsler
Sent: Monday, June 29, 2015 12:15 PM
To: 'kathy.howatt@maine.gov'; 'Wippelhauser, Gail'; 'John.Perry@maine.gov'; Antonio Bentivoglio; 'William.McDavitt@noaa.gov'; 'Sean McDermott - NOAA Federal'; 'francis.brautigam@maine.gov'; Dwayne.J.Seiders@maine.gov
Cc: Loon, Lewis; Loon, Sherri; Rachel Russo; Brandon Kulik
Subject: RE: habitat mapping - Lower Barker and American Tissue hydroelectric projects

Importance: High

Folks –

Given the recent rain and higher flows, plus other logistics, our schedule for the habitat mapping has shifted to the following:

American Tissue, this Thursday July 2, start time = 2:00 PM at the powerhouse.

Lower Barker, next Tuesday, July 7, start time = 10:00 AM at the powerhouse.

Many thanks!
Jesse
207-313-8296 (cell)

Jesse Wechsler
Senior Fisheries Scientist
207.487.3328, Ext. 278
www.KleinschmidtGroup.com

From: Jesse Wechsler
Sent: Wednesday, June 17, 2015 10:34 AM
To: 'kathy.howatt@maine.gov'; 'Wippelhauser, Gail'; 'John.Perry@maine.gov'; Antonio Bentivoglio; 'William.McDavitt@noaa.gov'; 'Sean McDermott - NOAA Federal'; 'francis.brautigam@maine.gov'; jason.seiders@maine.gov
Cc: Loon, Lewis; Loon, Sherri; Rachel Russo; Kelly Maloney; Brandon Kulik
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Weather permitting, we are planning to do the habitat mapping during the last week in June/first week in July (June 30 – July 3).

Let me know if you are interested in taking part and your availability that week, and we will schedule accordingly.

Thank you,
Jesse

Jesse Wechsler

From: Jesse Wechsler
Sent: Tuesday, June 30, 2015 3:22 PM
To: 'kathy.howatt@maine.gov'; 'Wippelhauser, Gail'; 'John.Perry@maine.gov'; Antonio Bentivoglio; 'William.McDavitt@noaa.gov'; 'Sean McDermott - NOAA Federal'; 'francis.brautigam@maine.gov'; Dwayne.J.Seiders@maine.gov
Cc: Loon, Lewis; Loon, Sherri; Rachel Russo
Subject: RE: habitat mapping - Lower Barker and American Tissue hydroelectric projects

Importance: High

Based on additional responses received yesterday, we are making the following change to the schedule for this work:

Lower Barker, next Tuesday, July 7, start time = 10:00 AM at the powerhouse.

American Tissue, next Thursday July 9, start time = 10:00 AM at the powerhouse.

I appreciate your flexibility and understanding as we try to accommodate schedules, weather, and operations. Undoubtedly, we will not be able to accommodate everyone. Apologies to anyone that this schedule change affects.

Best,
JW

Jesse Wechsler
Senior Fisheries Scientist
207.487.3328, Ext. 278
www.KleinschmidtGroup.com

From: Jesse Wechsler
Sent: Monday, June 29, 2015 12:15 PM
To: 'kathy.howatt@maine.gov'; 'Wippelhauser, Gail'; 'John.Perry@maine.gov'; Antonio Bentivoglio; 'William.McDavitt@noaa.gov'; 'Sean McDermott - NOAA Federal'; 'francis.brautigam@maine.gov'; 'Dwayne.J.Seiders@maine.gov'
Cc: Loon, Lewis; Loon, Sherri; Rachel Russo; Brandon Kulik
Subject: RE: habitat mapping - Lower Barker and American Tissue hydroelectric projects
Importance: High

Folks –

Given the recent rain and higher flows, plus other logistics, our schedule for the habitat mapping has shifted to the following:

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Lower Barker, next Tuesday, July 7, start time = 10:00 AM at the powerhouse.

Many thanks!
Jesse
207-313-8296 (cell)

Jesse Wechsler
Senior Fisheries Scientist

Jesse Wechsler

From: Seiders, Dwayne J <Dwayne.J.Seiders@maine.gov>
Sent: Wednesday, July 01, 2015 9:55 AM
To: Jesse Wechsler; Howatt, Kathy; Wippelhauser, Gail; Perry, John; Antonio Bentivoglio; 'William.McDavitt@noaa.gov'; 'Sean McDermott - NOAA Federal'; Brautigam, Francis
Cc: Loon, Lewis; Loon, Sherri; Rachel Russo
Subject: RE: habitat mapping - Lower Barker and American Tissue hydroelectric projects

Jesse,

I will try my best to be there next week. Kudos to you folks for trying to accommodate everyone's busy schedule.

Jason Seiders

Regional Fisheries Biologist
Maine Department of Inland Fisheries and Wildlife
Belgrade Lakes Regional Headquarters
270 Lyons Road
Sidney, ME 04330
(207) 547-5314

From: Jesse Wechsler [mailto:Jesse.Wechsler@KleinschmidtGroup.com]
Sent: Tuesday, June 30, 2015 3:22 PM
To: Howatt, Kathy; Wippelhauser, Gail; Perry, John; Antonio Bentivoglio; 'William.McDavitt@noaa.gov'; 'Sean McDermott - NOAA Federal'; Brautigam, Francis; Seiders, Dwayne J
Cc: Loon, Lewis; Loon, Sherri; Rachel Russo
Subject: RE: habitat mapping - Lower Barker and American Tissue hydroelectric projects
Importance: High

Based on additional responses received yesterday, we are making the following change to the schedule for this work:

Lower Barker, next Tuesday, July 7, start time = 10:00 AM at the powerhouse.

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I appreciate your flexibility and understanding as we try to accommodate schedules, weather, and operations. Undoubtedly, we will not be able to accommodate everyone. Apologies to anyone that this schedule change affects.

Best,
JW

Jesse Wechsler
Senior Fisheries Scientist
207.487.3328, Ext. 278
www.KleinschmidtGroup.com

From: Jesse Wechsler
Sent: Monday, June 29, 2015 12:15 PM
To: 'kathy.howatt@maine.gov'; 'Wippelhauser, Gail'; 'John.Perry@maine.gov'; Antonio Bentivoglio; 'William.McDavitt@noaa.gov'; 'Sean McDermott - NOAA Federal'; 'francis.brautigam@maine.gov';

Jesse Wechsler

From: Jesse Wechsler
Sent: Friday, July 24, 2015 5:13 PM
To: 'kathy.howatt@maine.gov'; 'Wippelhauser, Gail'; 'John.Perry@maine.gov'; Antonio Bentivoglio; 'William.McDavitt@noaa.gov'; 'Sean McDermott - NOAA Federal'; 'francis.brautigam@maine.gov'; Dwayne.J.Seiders@maine.gov
Cc: Loon, Lewis; Loon, Sherri; Rachel Russo; Brandon Kulik; Andy Qua
Subject: RE: habitat mapping - Lower Barker and American Tissue hydroelectric project (Phase 1 Memo)
Attachments: Phase 1 Memo Lower Barker Habitat Mapping_Proposed Transects doc 2015.07.24.pdf

Passing along the Phase 1 memo to summarize the results of habitat mapping on 7/7/15 at the Lower Barker Project on the Little Andro. Francis and Antonio were able to take part and helped us identify 3 transects in the reach for the actual instream flow study (Phase 2). Proposed transect locations and habitat info/pictures are shown and described in the attached.

We will complete the rest of the study this summer or fall, and will send additional notification of field efforts for those who would like to attend. Similar document for American Tissue in progress.

Let me know if any comments or questions.

Thank you!

Jesse Wechsler
Senior Fisheries Scientist
207.487.3328, Ext. 278
www.KleinschmidtGroup.com

From: Jesse Wechsler
Sent: Monday, July 06, 2015 12:31 PM
To: 'kathy.howatt@maine.gov'; 'Wippelhauser, Gail'; 'John.Perry@maine.gov'; 'Antonio Bentivoglio'; 'William.McDavitt@noaa.gov'; 'Sean McDermott - NOAA Federal'; 'francis.brautigam@maine.gov'; 'Dwayne.J.Seiders@maine.gov'
Cc: 'Loon, Lewis'; 'Loon, Sherri'; Rachel Russo
Subject: RE: habitat mapping - Lower Barker and American Tissue hydroelectric projects

Just confirming that Rachel and I will be on site tomorrow for a couple of hours starting at 10 AM near the powerhouse at the Lower Barker site, which is off of Mill Road in between 5th and South Main (Route 136). Here is a Bing map.

http://binged.it/1J0GfM1

We will be mapping habitat in the bypassed reach by foot or by canoe if needed, and identifying potential transect locations.

Thank you,
Jesse
207-313-8296

Jesse Wechsler
Senior Fisheries Scientist
207.487.3328, Ext. 278
www.KleinschmidtGroup.com

Jesse Wechsler

From: Brautigam, Francis <Francis.Brautigam@maine.gov>
Sent: Tuesday, November 10, 2015 8:13 AM
To: Jesse Wechsler
Cc: Pellerin, James; Perry, John; Howatt, Kathy; Steve Shepard (steven_shepard@fws.gov); Wippelhauser, Gail; Antonio Bentivoglio (antonio_bentivoglio@fws.gov); Loon, Sherri; Loon, Sherri; Andy Qua
Subject: RE: Lower Barker studies

Jesse, Thanks for rescheduling. Suitable minimum flows and angler access remain two very important issues for MDIFW in the relicensing of this project. With the exception of Thursday Dec 3rd of that week (11/30) I am available and will leave my calendar open that week to accommodate rescheduling. Francis

From: Jesse Wechsler [mailto:Jesse.Wechsler@KleinschmidtGroup.com]
Sent: Monday, November 09, 2015 6:09 PM
To: Brautigam, Francis
Cc: Pellerin, James; Perry, John; Howatt, Kathy; Steve Shepard (steven_shepard@fws.gov); Wippelhauser, Gail; Antonio Bentivoglio (antonio_bentivoglio@fws.gov); Loon, Sherri; Loon, Sherri; Andy Qua
Subject: RE: Lower Barker studies

Hi Francis –

I did send out an email in September asking that anyone interested let me know so that we could schedule accordingly but I didn't receive any responses.

Given low flows, then high flows plus scheduling around other work commitments we have been unable to schedule the work until now. I confirmed today that KEI had stopped spilling and could provide the flows we need for the study, and so we mobilized quickly.

At this point we will postpone, and shoot for the week of 11/30, unless you are available later this week? Unfortunately, the weather looks a rainy towards the end of the week. We plan to be on site for 2 days.

Best,
JW

Jesse Wechsler
Senior Fisheries Scientist
207.487.3328, Ext. 278
www.KleinschmidtGroup.com

From: Brautigam, Francis [mailto:Francis.Brautigam@maine.gov]
Sent: Monday, November 09, 2015 4:51 PM
To: Jesse Wechsler <Jesse.Wechsler@KleinschmidtGroup.com>
Cc: Pellerin, James <James.Pellerin@maine.gov>; Perry, John <John.Perry@maine.gov>; Howatt, Kathy <Kathy.Howatt@maine.gov>; Steve Shepard (steven_shepard@fws.gov) <steven_shepard@fws.gov>; Wippelhauser, Gail <Gail.Wippelhauser@maine.gov>; Antonio Bentivoglio (antonio_bentivoglio@fws.gov) <antonio_bentivoglio@fws.gov>
Subject: RE: Lower Barker studies

Jesse, it is **imperative** that MDIFW view the flow releases and **participate** in the flow study. We are still in the midst of field work and you have not provided reasonable advance notice to participate. I would request that you reschedule the flow study to permit our participation. If the study in conducted in our absence we will file a complaint with FERC and the MDEP. Francis

Francis Brautigam
Regional Fishery Biologist
Sebago Lake Region, MDIFW
358 Shaker Road
Gray, Maine 04039
657-2345, ext 112

From: Jesse Wechsler [mailto:Jesse.Wechsler@KleinschmidtGroup.com]
Sent: Monday, November 09, 2015 3:35 PM
To: Brautigam, Francis
Subject: Lower Barker studies

Francis –

Wanted to let you know that will be finally performing the instream flow study tomorrow and Wednesday at Lower Barker. Just going to be me and my crew, with Phil the operator releasing flows. Feel free to swing by and track us down.

Also wanted to let you know that we got together last week with NOAA/MDMR/MDEP to talk fish passage, and so I gave a brief study update/progress report. For some reason, we completely forgot to invite MDIFW. Not a whole lot to review in terms of results yet, but I'd be happy to forward you the PPT that we used, if you like?

My cell phone is 207-313-8296.

Jesse Wechsler
Senior Fisheries Scientist
207.487.3328, Ext. 278
www.KleinschmidtGroup.com

Jesse Wechsler

From: William McDavitt - NOAA Affiliate <william.mcdavitt@noaa.gov>
Sent: Monday, November 30, 2015 10:38 AM
To: Jesse Wechsler
Cc: Brautigam, Francis; Pellerin, James; Perry, John; Howatt, Kathy; Steve Shepard (steven_shepard@fws.gov); Wippelhauser, Gail; Antonio Bentivoglio (antonio_bentivoglio@fws.gov); Loon, Sherri; Andy Qua; Brown, Michael; Rachel Russo; Sean McDermott - NOAA Federal
Subject: Re: Lower Barker instream flow study

Jesse,
Thank you for the update. I realize you can't predict next years flow conditions. Nevertheless, do you have a rough/ballpark anticipated time frame for when you hope to complete the study?
Regards,
-Bill

Bill McDavitt
Environmental Specialist
Integrated Statistics, Inc.

Under contract to National Marine Fisheries Service
Greater Atlantic Regional Fisheries Office
55 Great Republic Drive
Gloucester, MA 01930
978-675-2156
William.mcdavitt@noaa.gov

On Mon, Nov 30, 2015 at 10:30 AM, Jesse Wechsler <Jesse.Wechsler@kleinschmidtgroup.com> wrote:

Folks,

Just wanted to let you know that we are officially "punting" the Lower Barker instream flow study until next field season. Conditions are not suitable / safe for performing this type of work at this time of the year, and the weather is iffy this week at best.

We are beginning the process of developing study reports for the work that was completed this year at Lower Barker and American Tissue, and plan to have those study reports available by late-February or mid-March for your review. Please let me know if you have any questions about the reporting/review process.

Best,

Jesse

Jesse Wechsler

Senior Fisheries Scientist

207.487.3328, Ext. 278

Jesse Wechsler

From: Howatt, Kathy <Kathy.Howatt@maine.gov>
Sent: Thursday, April 28, 2016 10:54 AM
To: Jesse Wechsler
Subject: RE: Lower Barker Instream Flow habitat study - update

Jesse,
I am interested in attending, and so will appreciate inclusion in the scheduling emails and other info you might be sending out. thanks,
Kathy

Kathy Davis Howatt
Hydropower Coordinator
Bureau of Land Resources, Land Division
Maine Department of Environmental Protection
Phone: 207-446-2642
kathy.howatt@maine.gov

From: Jesse Wechsler [mailto:Jesse.Wechsler@KleinschmidtGroup.com]
Sent: Thursday, April 28, 2016 8:56 AM
To: Brautigam, Francis; Howatt, Kathy; OConnor, Michael; Antonio Bentivoglio (antonio_bentivoglio@fws.gov); William McDavitt - NOAA Affiliate; Loon, Sherri; Loon, Lewis; Brandon Kulik; Rachel Russo; Andy Qua; Karen Klosowski
Subject: Lower Barker Instream Flow habitat study - update

Hi All,

This is an update for those interested in taking part in the instream flow habitat study in the reach below the Lower Barker dam. Right now, we are targeting May 11 (Wednesday) and May 12 (Thursday). However, the study is highly contingent on natural inflow. A river flow of approximately 50 cfs at the South Paris gage generally equates to non-spill conditions at the dam, which we need to complete the study. The current gage reading is 113 cfs so the dam is in spill mode.

The plan is to release 5 flows from the gates at the dam and take physical measurements across 3 transects, as well as perform qualitative observations. We cannot guarantee that we will be able to do all 5 flows in one effort as we will need a couple of hours at each flow. Likely going to start with the low flows, and work our way up, and may need to split into two separate efforts. Below is a potential flow release schedule for the study:

Flow	Purpose of Flow Release	Date / Time
20	Habitat flow 1	Wednesday May 11; 9:00 – 12:00
50	Habitat flow 2	Wednesday May 11; 1:00 - 4:00
100	Habitat flow 3	Wednesday May 11; 4:00 – 7:00
175	Habitat flow 4	Thursday, May 12; 9:00-12:00
300	Habitat flow 5	Thursday, May 12; 1:00 – 4:00

I will send an update next week if it looks like a go for 5/11 and 5/12. If not, we would like to shoot for the following week or later in May. Alternatively, If river flow drops off considerably over the next week, we may bump the schedule forward. Please recognize that KEI has limited control over what can be done with regard to river flow and suitable study conditions. We appreciate your flexibility.

Could you please let me know if you plan to attend so that I can send you more details in subsequent emails?

Many thanks in advance!
Jesse

Jesse Wechsler
Senior Fisheries Scientist
207.487.3328, Ext. 278
www.KleinschmidtGroup.com

Jesse Wechsler

From: OConnor, Michael <Michael.OConnor@maine.gov>
Sent: Thursday, April 28, 2016 11:47 AM
To: Jesse Wechsler
Subject: RE: Lower Barker Instream Flow habitat study - update

Hi Jesse,

Thanks for the heads up. I'm definitely interested in participating although my wife is expecting a baby any day now (her due date was yesterday), so my schedule is going to be restricted in May depending on when the baby decides to come out. Can you keep me in the loop if the study gets pushed back later in May?

Thanks,
Mike

Michael O'Connor
Licensing Project Manager
Bureau of Land Resources
Maine Department of Environmental Protection
207-441-1732
Michael.OConnor@maine.gov

From: Jesse Wechsler [mailto:Jesse.Wechsler@KleinschmidtGroup.com]
Sent: Thursday, April 28, 2016 8:56 AM
To: Brautigam, Francis; Howatt, Kathy; OConnor, Michael; Antonio Bentivoglio (antonio_bentivoglio@fws.gov); William McDavitt - NOAA Affiliate; Loon, Sherri; Loon, Lewis; Brandon Kulik; Rachel Russo; Andy Qua; Karen Klosowski
Subject: Lower Barker Instream Flow habitat study - update

Hi All,

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The plan is to release 5 flows from the gates at the dam and take physical measurements across 3 transects, as well as perform qualitative observations. We cannot guarantee that we will be able to do all 5 flows in one effort as we will need a couple of hours at each flow. Likely going to start with the low flows, and work our way up, and may need to split into two separate efforts. Below is a potential flow release schedule for the study:

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Jesse Wechsler

From: Brautigam, Francis <Francis.Brautigam@maine.gov>
Sent: Thursday, April 28, 2016 12:03 PM
To: Jesse Wechsler; Howatt, Kathy; OConnor, Michael; Antonio Bentivoglio (antonio_bentivoglio@fws.gov); William McDavitt - NOAA Affiliate; Loon, Sherri; Loon, Lewis; Brandon Kulik; Rachel Russo; Andy Qua; Karen Klosowski
Cc: Pellerin, James; Perry, John
Subject: RE: Lower Barker Instream Flow habitat study - update

Jesse, Thanks for trying to plan around challenging flows. Jim Pellerin and/or myself are planning to attend on behalf of IFW. Francis

From: Jesse Wechsler [mailto:Jesse.Wechsler@KleinschmidtGroup.com]
Sent: Thursday, April 28, 2016 8:56 AM
To: Brautigam, Francis; Howatt, Kathy; OConnor, Michael; Antonio Bentivoglio (antonio_bentivoglio@fws.gov); William McDavitt - NOAA Affiliate; Loon, Sherri; Loon, Lewis; Brandon Kulik; Rachel Russo; Andy Qua; Karen Klosowski
Subject: Lower Barker Instream Flow habitat study - update

Hi All,

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I will send an update next week if it looks like a go for 5/11 and 5/12. If not, we would like to shoot for the following week or later in May. Alternatively, If river flow drops off considerably over the next week, we may bump the schedule forward. Please recognize that KEI has limited control over what can be done with regard to river flow and suitable study conditions. We appreciate your flexibility.

Could you please let me know if you plan to attend so that I can send you more details in subsequent emails?

Many thanks in advance!
Jesse

Jesse Wechsler

From: Jesse Wechsler
Sent: Tuesday, May 24, 2016 3:44 PM
To: 'Brautigam, Francis'; 'Howatt, Kathy'; 'OConnor, Michael'; 'Antonio Bentivoglio (antonio_bentivoglio@fws.gov)'; Pellerin, James; 'William McDavitt - NOAA Affiliate'; 'Loon, Sherri'; 'Loon, Lewis'; Brandon Kulik; Rachel Russo; Andy Qua; Steve Knapp; Sarah Drahovzal; Nash, Alex
Subject: RE: Lower Barker Instream Flow habitat study - update 5-24-16

Hi All,

This is another update for those interested in taking part in the instream flow habitat study in the reach below the Lower Barker dam. Right now, we are targeting June 1 (Wednesday) and June 2 (Thursday).

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KEI has limited control over river flow and suitable study conditions. No guarantee that we will be able to do all 5 flows in one effort. We appreciate your flexibility.

I will send an email early next week to confirm.

Best,

Jesse Wechsler
Senior Fisheries Scientist
207.487.3328, Ext. 278
www.KleinschmidtGroup.com

Jesse Wechsler

From: Pellerin, James <James.Pellerin@maine.gov>
Sent: Wednesday, May 25, 2016 8:26 AM
To: Jesse Wechsler
Cc: Brautigam, Francis
Subject: RE: Lower Barker Instream Flow habitat study - update 5-24-16

Jesse –

I just remembered I can't make Thursday as I have another commitment in Augusta. I suspect Francis can participate without me.

From: Jesse Wechsler [mailto:Jesse.Wechsler@KleinschmidtGroup.com]
Sent: Tuesday, May 24, 2016 3:44 PM
To: Brautigam, Francis; Howatt, Kathy; OConnor, Michael; 'Antonio Bentivoglio (antonio_bentivoglio@fws.gov)'; Pellerin, James; 'William McDavitt - NOAA Affiliate'; 'Loon, Sherri'; 'Loon, Lewis'; Brandon Kulik; Rachel Russo; Andy Qua; Steve Knapp; Sarah Drahovzal; Nash, Alex
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From: Howatt, Kathy <Kathy.Howatt@maine.gov>
Sent: Tuesday, May 31, 2016 1:26 PM
To: Jesse Wechsler
Subject: RE: Lower Barker Instream Flow habitat study - update 5-24-16

Thanks for the update Jesse. Is there a designated spot where parking is allowed? I think I remember parking as an issue for this site.
Kathy

Kathy Davis Howatt
Hydropower Coordinator
Bureau of Land Resources, Land Division
Maine Department of Environmental Protection
Phone: 207-446-2642
kathy.howatt@maine.gov

From: Jesse Wechsler [mailto:Jesse.Wechsler@KleinschmidtGroup.com]
Sent: Tuesday, May 31, 2016 12:27 PM
To: Brautigam, Francis; Howatt, Kathy; OConnor, Michael; 'Antonio Bentivoglio (antonio_bentivoglio@fws.gov)'; Pellerin, James; 'William McDavitt - NOAA Affiliate'; 'Loon, Sherri'; 'Loon, Lewis'; Brandon Kulik; Rachel Russo; Andy Qua; Steve Knapp; 'Nash, Alex'
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I am assuming that you have all been to the site or can find the site – the dam is located on Mill Road in Auburn, about 0.2 miles from the intersection of Mill and Main St on the right. See attached photo.

My cell phone is 313-8296.

Best!

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www.KleinschmidtGroup.com

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From: Howatt, Kathy <Kathy.Howatt@maine.gov>
Sent: Tuesday, June 07, 2016 8:15 AM
To: Jesse Wechsler; Brautigam, Francis; OConnor, Michael; 'Antonio Bentivoglio (antonio_bentivoglio@fws.gov)'; Pellerin, James; 'William McDavitt - NOAA Affiliate'; 'Loon, Sherri'; 'Loon, Lewis'; Brandon Kulik; Rachel Russo; Andy Qua; Steve Knapp; 'Nash, Alex'
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Hydropower Coordinator
Bureau of Land Resources, Land Division
Maine Department of Environmental Protection
Phone: 207-446-2642
kathy.howatt@maine.gov

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Subject: RE: Lower Barker Instream Flow POSTPONED FOR THIS WEEK
Importance: High

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As always, thank you for patience and flexibility,

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To: Jesse Wechsler; Brautigam, Francis; OConnor, Michael; 'Antonio Bentivoglio (antonio_bentivoglio@fws.gov)'; Pellerin, James; 'William McDavitt - NOAA Affiliate'; 'Loon, Sherri'; 'Loon, Lewis'; Brandon Kulik; Rachel Russo; Andy Qua; Steve Knapp; 'Nash, Alex'
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Kathy Davis Howatt
Hydropower Coordinator
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Phone: 207-446-2642
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Cc: Jesse Wechsler; Brautigam, Francis; OConnor, Michael; Pellerin, James; William McDavitt - NOAA Affiliate; Loon, Sherri; Loon, Lewis; Brandon Kulik; Rachel Russo; Andy Qua; Steve Knapp; Nash, Alex
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Sent from my iPhone

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> Hydropower Coordinator
> Bureau of Land Resources, Land Division
> Maine Department of Environmental Protection
> Phone: 207-446-2642
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> ***Correspondence to and from this office is considered a public record and may be subject to a request under the Maine Freedom of Access Act. Information that you wish to keep confidential should not be included in email correspondence.***
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Jesse Wechsler

From: William McDavitt - NOAA Affiliate <william.mcdavitt@noaa.gov>
Sent: Friday, June 10, 2016 6:58 AM
To: Jesse Wechsler
Cc: Howatt, Kathy; OConnor, Michael; Antonio Bentivoglio (antonio_bentivoglio@fws.gov); Pellerin, James; Loon, Sherri; Loon, Lewis; Brandon Kulik; Rachel Russo; Andy Qua; Steve Knapp; Sarah Drahovzal; Nash, Alex
Subject: Re: Lower Barker Instream Flow update 6-9

I'll be at the USGS Conte lab with Jesse's colleague Kevin Nebiolo and others reviewing Turners Falls telemetry data, so Friday is out for me.

Bill McDavitt
Environmental Specialist
Integrated Statistics, Inc.

Under contract to National Marine Fisheries Service
Greater Atlantic Regional Fisheries Office
55 Great Republic Drive
Gloucester, MA 01930
978-675-2156
William.mcdavitt@noaa.gov

On Thu, Jun 9, 2016 at 5:22 PM, Jesse Wechsler <Jesse.Wechsler@kleinschmidtgroup.com> wrote:

Hello All,

Another update for you. We were able to collect data at two flow releases yesterday, and are tentatively going to be on site tomorrow to collect data at the three remaining study flows. We should know definitively tomorrow AM as to whether the river is cooperative. Please feel free to email me or call me in the morning after 800 AM to confirm whether we will be on site, and please feel free to stop by for a birds eye view.

Many thanks,

Jesse

207-313-8296 (cell)

Jesse Wechsler

Senior Fisheries Scientist

207.487.3328, Ext. 278

www.KleinschmidtGroup.com

From: Jesse Wechsler
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Subject: RE: Lower Barker Instream Flow POSTPONED FOR THIS WEEK
Importance: High

All,

Jesse Wechsler

From: OConnor, Michael <Michael.OConnor@maine.gov>
Sent: Friday, June 10, 2016 8:19 AM
To: Jesse Wechsler
Subject: RE: Lower Barker Instream Flow update 6-9

Sounds good Jesse, I'll likely come in the afternoon.

Michael O'Connor
Licensing Project Manager
Bureau of Land Resources
Maine Department of Environmental Protection
207-441-1732
Michael.OConnor@maine.gov

From: Jesse Wechsler [mailto:Jesse.Wechsler@KleinschmidtGroup.com]
Sent: Friday, June 10, 2016 8:09 AM
To: Howatt, Kathy; OConnor, Michael; 'Antonio Bentivoglio (antonio_bentivoglio@fws.gov)'; Pellerin, James; 'William McDavitt - NOAA Affiliate'; 'Loon, Sherri'; 'Loon, Lewis'; Brandon Kulik; Rachel Russo; Andy Qua; Steve Knapp; Sarah Drahovzal; 'Nash, Alex'
Subject: RE: Lower Barker Instream Flow update 6-9

Hi all, just confirmed with KEI that they will be able to provide flows for the study today. We will be looking at the lower flows today of approximately 20, 50, and 100 cfs, starting at around 930-945. There is parking at the dam on Mill Road. My crew and I will be on the water most of the day and will be generally accessing the river from behind the marketing company building near the powerhouse. There are transect lines strung up across the river and we will be taking measurements across the transects throughout the day.

My cell is 313-8296. Shouldn't be hard to find us!

Jesse

Sent from my Verizon Wireless 4G LTE smartphone

-------- Original message --------
From: Jesse Wechsler <Jesse.Wechsler@KleinschmidtGroup.com>
Date: 06/09/2016 5:22 PM (GMT-05:00)
To: "'Howatt, Kathy'" <Kathy.Howatt@maine.gov>, "'OConnor, Michael'" <Michael.OConnor@maine.gov>, "'Antonio Bentivoglio (antonio_bentivoglio@fws.gov)'" <antonio_bentivoglio@fws.gov>, "'Pellerin, James'" <James.Pellerin@maine.gov>, 'William McDavitt - NOAA Affiliate' <william.mcdavitt@noaa.gov>, "'Loon, Sherri'" <Sherri.Loon@kruger.com>, "'Loon, Lewis'" <LewisC.Loon@kruger.com>, Brandon Kulik <Brandon.Kulik@KleinschmidtGroup.com>, Rachel Russo <Rachel.Russo@KleinschmidtGroup.com>, Andy Qua <Andy.Qua@KleinschmidtGroup.com>, Steve Knapp <Steve.Knapp@KleinschmidtGroup.com>, Sarah Drahovzal <Sarah.Drahovzal@KleinschmidtGroup.com>, "'Nash, Alex'" <AlexM.Nash@kruger.com>
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Jesse Wechsler

From: Howatt, Kathy <Kathy.Howatt@maine.gov>
Sent: Monday, June 13, 2016 11:39 AM
To: Jesse Wechsler
Subject: RE: Lower Barker

OK, that's good. I can be available tomorrow and I'd like to attend if possible. Thanks,
Kathy

Kathy Davis Howatt
Hydropower Coordinator
Bureau of Land Resources, Land Division
Maine Department of Environmental Protection
Phone: 207-446-2642
kathy.howatt@maine.gov

From: Jesse Wechsler [mailto:Jesse.Wechsler@KleinschmidtGroup.com]
Sent: Monday, June 13, 2016 9:56 AM
To: Howatt, Kathy
Subject: RE: Lower Barker

Hi Kathy,

No we did not. We are waiting to hear from KEI as to whether they have enough water to do more work tomorrow. We still need to do the low-flow release of 20 cfs.

I will let you know once I hear back.

Thanks,
JW

Jesse Wechsler
Senior Fisheries Scientist
207.487.3328, Ext. 278
www.KleinschmidtGroup.com

From: Howatt, Kathy [mailto:Kathy.Howatt@maine.gov]
Sent: Monday, June 13, 2016 9:54 AM
To: Jesse Wechsler <Jesse.Wechsler@KleinschmidtGroup.com>
Subject: Lower Barker

Jesse,
Did you finish the Instream Flow Study on Friday?
Kathy

Kathy Davis Howatt
Hydropower Coordinator
Bureau of Land Resources, Land Division
Maine Department of Environmental Protection
Phone: 207-446-2642
kathy.howatt@maine.gov

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From:	Andy Qua
To:	Eric Cousens
Cc:	Jesse Wechsler; Loon, Lewis; Loon, Sherri
Subject:	RE: Lower Barker Project
Date:	Tuesday, July 26, 2016 1:28:29 PM
Attachments:	image002.png image003.png

Hi Eric – KEI will have an operator available for September 17 and also block out 10/1 and 10/8 as potential back-up dates. As you get things lined up with your folks, let me know if there are time preferences (i.e., morning vs. afternoon). Depending on water availability we could have all we need for people to do several trips at different flows or we may be lucky to get short windows. I think targeting a mid-morning start time would be safer that waiting until afternoon. Does that sound okay for your end?

Thank you,
Andy

From: Andy Qua
Sent: Friday, July 15, 2016 10:45 AM
To: 'Eric Cousens' <ECousens@auburnmaine.gov>
Cc: Jesse Wechsler <Jesse.Wechsler@KleinschmidtGroup.com>; Loon, Lewis <LewisC.Loon@kruger.com>
Subject: RE: Lower Barker Project

Hi Eric – if inflow cooperates, I think that works. Let me just check with Chuck to make sure the operator can be available. I will circle back with you early next week. For a backup I think 10/1 or 10/8 would probably be better than later in the month from paddler's perspectives with temperatures and would be a couple week gap from September 17/18 where rain events could improve water availability.

From: Eric Cousens [mailto:ECousens@auburnmaine.gov]
Sent: Thursday, July 14, 2016 2:36 PM
To: Andy Qua <Andy.Qua@KleinschmidtGroup.com>
Cc: Jesse Wechsler <Jesse.Wechsler@KleinschmidtGroup.com>; Loon, Lewis <LewisC.Loon@kruger.com>
Subject: RE: Lower Barker Project

Andy,

What do you think about September 17th or 18th? As a back up any Saturday in October could also work.

Eric J. Cousens
Deputy Director of Economic and Community Development, City of Auburn
60 Court Street | Auburn, Maine 04210 | 207.333.6601 X1154

-

From: Andy Qua [mailto:Andy.Qua@KleinschmidtGroup.com]
Sent: Friday, July 08, 2016 1:36 PM
To: Eric Cousens
Cc: Jesse Wechsler; Loon, Lewis
Subject: RE: Lower Barker Project

Great – thanks Eric. If you need to talk through anything, I should be in the office most of the week and if needed can make a run down to Auburn.

From: Eric Cousens [mailto:ECousens@auburnmaine.gov]
Sent: Friday, July 08, 2016 1:32 PM
To: Andy Qua <Andy.Qua@KleinschmidtGroup.com>
Cc: Jesse Wechsler <Jesse.Wechsler@KleinschmidtGroup.com>; Loon, Lewis <LewisC.Loon@kruger.com>
Subject: RE: Lower Barker Project

Thanks Andy,
We are connecting with the Land Trust next week to suggest some dates. Mid September and backup in October sounds perfect.

Eric J. Cousens
Deputy Director of Economic and Community Development, City of Auburn
60 Court Street | Auburn, Maine 04210 | 207.333.6601 X1154

-

From: Andy Qua [mailto:Andy.Qua@KleinschmidtGroup.com]
Sent: Thursday, June 16, 2016 3:20 PM
To: Eric Cousens

Cc: Jesse Wechsler; Loon, Lewis
Subject: RE: Lower Barker Project

Hi Eric –

I agree that July may be difficult, particularly with the lack of precipitation thus far. We had to make several attempts for the habitat flow study which has much lower flow increments.

Given the effort that may be needed on your end to coordinate with your folks, it may make more sense for you to tell us a couple dates you would like to target. Maybe a preferred date and "rain date" a week or two later in case there is not enough water and no rain the immediate forecast. Or maybe one in mid-September and one in early October as a backup? Does that make sense? October could be on the cool side but I am assuming paddlers will have the gear they need for that.

Let me know your thoughts on that approach.
Thank you,
Andy

From: Eric Cousens [mailto:ECousens@auburnmaine.gov]
Sent: Thursday, June 16, 2016 1:03 PM
To: Andy Qua <Andy.Qua@KleinschmidtGroup.com>
Cc: Jesse Wechsler <Jesse.Wechsler@KleinschmidtGroup.com>; Loon, Lewis <LewisC.Loon@kruger.com>
Subject: RE: Lower Barker Project

Andy,
I just received this email as it was filtered out as junk for some reason. I discussed the recreational flow study being in the fall with Lewis Loon and asked for 60 days notice. Can I get an update soon and I can get the word out for whenever you are planning it? It is likely that there will not be flows for the study in July isn't it? That is why we thought fall made sense.

Eric J. Cousens
Deputy Director of Planning and Development
60 Court Street, Suite 104
Auburn, Maine 04210
Tel. (207)333-6601, ext. 1154
Fax. (207)333-6625
email: ecousens@auburnmaine.gov

-

From: Andy Qua [mailto:Andy.Qua@KleinschmidtGroup.com]
Sent: Wednesday, May 04, 2016 10:47 AM
To: Eric Cousens
Cc: Jesse Wechsler; Loon, Lewis
Subject: RE: Lower Barker Project

Good morning Eric –

I just spoke with Chuck and understand you would like us to schedule recreation flow field efforts about 60 days from the middle of May (i.e., early/mid July). We will plan for that timeframe to do the study work in coordination with you or whomever you plan to have involved. In the meantime, we are going to maintain our plans to do the habitat related flow study work in the next couple weeks. Right now we plan to do that work next week, but it looks like river flows from the recent heavy rain may push that out. We do not think we can confirm the dates for the habitat flow release work until the first of next week. I will have Jesse include you on the email list with the agencies he is coordinating with for that, in the event you wish to observe.

Please let us know if you have any questions.

Thank you,
Andy

From: Andy Qua
Sent: Friday, April 15, 2016 3:22 PM
To: 'ecousens@auburnmaine.gov' <ecousens@auburnmaine.gov>
Cc: Jesse Wechsler <Jesse.Wechsler@KleinschmidtGroup.com>; Loon, Lewis <LewisC.Loon@kruger.com>
Subject: Lower Barker Project

Good afternoon Eric –

We are in the process of scheduling flow related field studies (habitat and recreation), depending on inflow to the dam we are targeting doing both at the same time. Tentatively we are planning for May 11-13 timeframe because that is open for at least one of the two fish and wildlife agency representative that want to be there. We have not yet confirmed with the other that wants to participate so that may change over the course of the next week.

The project is operated in a run-of-river mode and any flow releases have to be provided to the bypass reach by throttling or shutting off the unit, and the headpond generally cannot be drawn down except for emergency or maintenance. Therefore it may be difficult to time it on those dates, but we will be monitoring upstream gage data to help predict river flow. There may be plenty of water and it isn't an issue. So if you or others you know plan to be there for the recreational perspective, please understand that the date may have to shift on short notice.

If you have contact information for individuals that should be kept informed, please provide that.

Thank you,
Andy

Andrew D. Qua
Regulatory Team Leader
Kleinschmidt
Office: 207.416.1246
www.KleinschmidtGroup.com

APPENDIX E

GATE OPENING CALCULATIONS
FOR
INSTREAM FLOW STUDY

KEI (USA) POWER MANAGEMENT
37 Alfred A Plourde Parkway, Lewiston, ME
Phone: (207) 440-4728
Email: alex.nash@kruger.com

Revision No. 2

Project: LOWER BARKER

By: Alex Nash Date: 5/5/2016

Subject: DEEP GATE FLOW CALCULATIONS

KNOWN VARIABLES

	Variable	Value	Units	Source/Reference
1	Deep Gate Width	8.33	ft	K20022 - "Dam - Plan View"
2	Deep Gate Sill Elevation	146.80	ft	K20067 - "Section B-B"
3	Normal Headpond Elevation	165.00	ft	K20021 - "Section"
4	Water Unit Weight	62.40	pcf	Known property of water
5	Acceleration due to gravity	32.20	ft/s^2	Known variable

ASSUMPTIONS

6 - Assume the complicated hydraulic structure of a steel slide gate leading to an angled smaller concrete
7 opening does not seriously affect the flow calculations.
8 - Assume the information on the drawings is accurate
9 - Assume the Coefficient of discharge is similar to that of a thin plate orifice - 0.6

REFERENCES

10 1) Drawing K20022
11 2) Drawing K20067
12 3) Drawing K20021
13 4) Creager, W., & Justin, J., (1950). *Hydroelectric Handbook Second Edition* . New York: John Wiley & Sons, Inc.

HYDRAULIC FLOW CALCULATIONS

14 The methodology will be as presented in Chapter 8 of Creager and Justin's Hydroelectric Handbook 2nd Edition.
15 As stated above, the discharge coefficient for the sluice gate is assumed to be 0.6. The flows required are 20, 50,
16 100, 175, and 300 cfs.
17
18 *Formula Derivation*
19 $Q = C * A * \sqrt[2]{2 * g * h}$
20
21 $h = \frac{1}{2 * g} * \left(\frac{Q}{C * A}\right)^2$
22
23 $h = 165.0 - 146.8 - y/2$
24 $A = 8.33 * y$
25
26 $y = \left[\frac{1}{2 * g} * \left(\frac{Q}{C * 8.33 * y}\right)^2 + 146.8 - 165.0\right] * -2$
27
28 $Q = C * 8.33 * \frac{y}{12} * \sqrt[2]{2 * g * (165.0 - 146.8 - \frac{y}{24})}$
29

KEI (USA) POWER MANAGEMENT
37 Alfred A Plourde Parkway, Lewiston, ME
Phone: (207) 440-4728
Email: alex.nash@kruger.com

Revision No. 2

Project: LOWER BARKER

By: Alex Nash Date: 5/5/2016

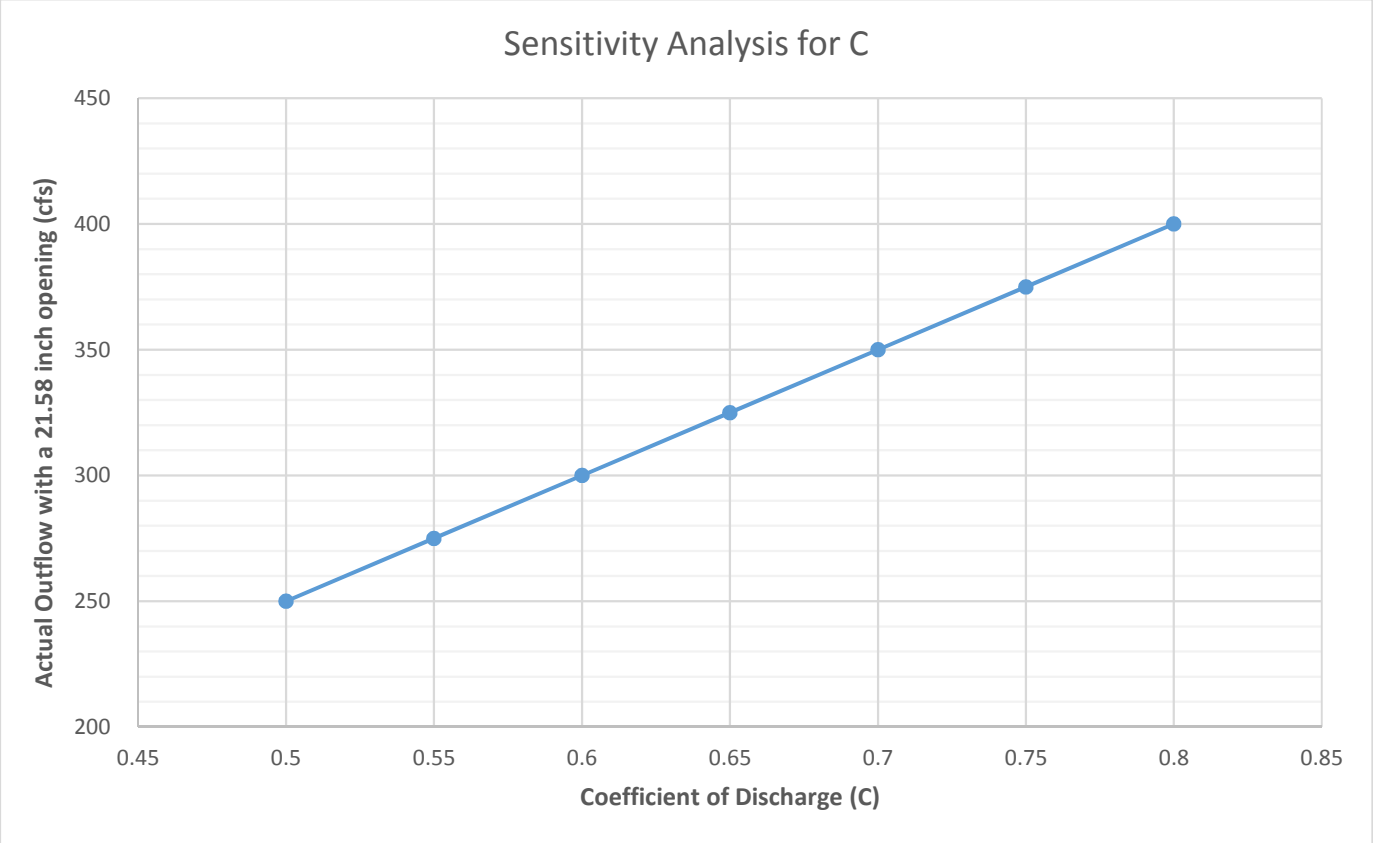
Subject: DEEP GATE FLOW CALCULATIONS

RESULTS OF ANALYSIS

	Required Flow (Q)	Calculated Flow base on *y*	Result (*y*)
31	20	20.00	1.40
32	50	50.00	3.52
33	100	100.00	7.07
34	175	175.00	12.45
35	300	300.00	21.58

SENSITIVITY ANALYSIS FOR C @ Q = 300 CFS

36	0.5	250.00	21.58
37	0.55	275.00	21.58
38	0.6	300.00	21.58
39	0.65	325.00	21.58
40	0.7	350.00	21.58
41	0.75	375.00	21.58
42	0.8	400.00	21.58



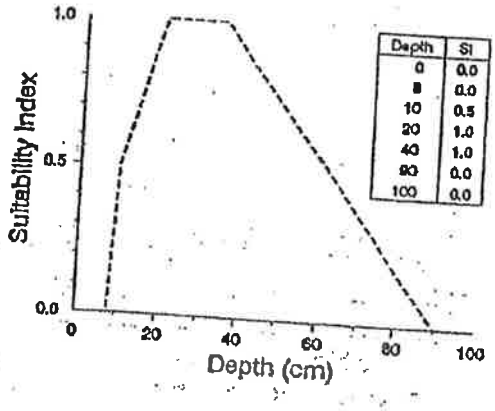
APPENDIX F

HABITAT SUITABILITY CRITERIA
FOR
INSTREAM FLOW STUDY

Reproductive Component

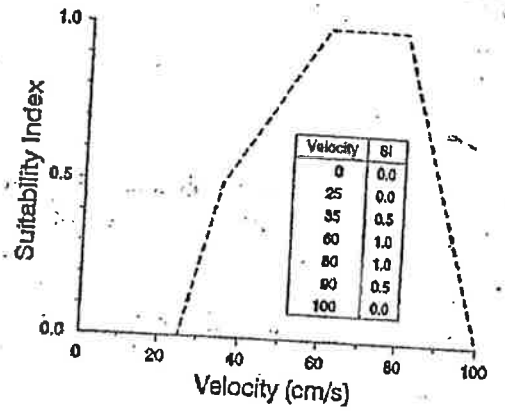
Evaluate at the head or tail of pools only if the substrate material is > 2.2 to 256 mm in diameter and water is at least 15 cm deep. The best time to conduct the field work would be in the fall, when Atlantic salmon are selecting spawning areas. Otherwise, attempt to estimate fall conditions by historical information on seasonal variation.

V12: Mean depth for reproduction at spawning time.



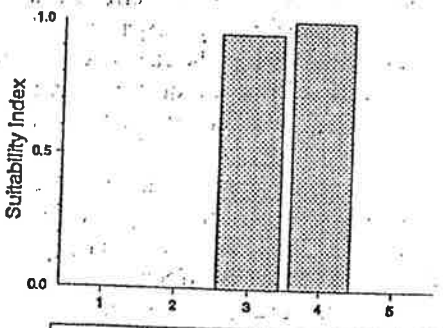
Depth	SI
0	0.0
5	0.0
10	0.5
20	1.0
40	1.0
90	0.0
100	0.0

V13: Mean column velocity for reproduction during fall, or at flow conditions approximating those occurring during fall.



Velocity	SI
0	0.0
25	0.0
35	0.5
60	1.0
80	1.0
90	0.5
100	0.0

V17: Dominant substrate for spawning and embryo incubation.

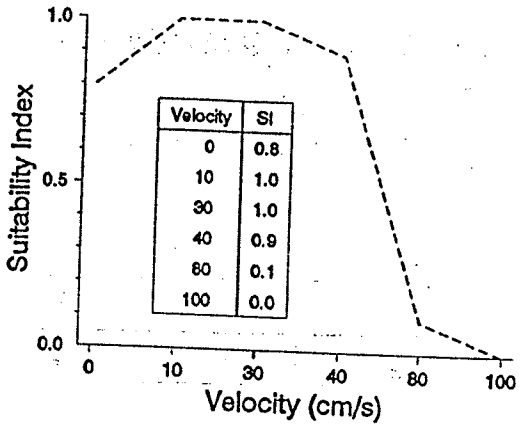


Substrate Code	Substrate Type	Size (mm)	SI
1	Fines	< 0.5	0.00
2	Sand	0.5 - 2.2	0.00
3	Pebble-gravel	> 2.2 - 22.2	0.05
4	Cobble	> 22.2 - 256	1.00
5	Boulder	> 256	0.00

Fry Component

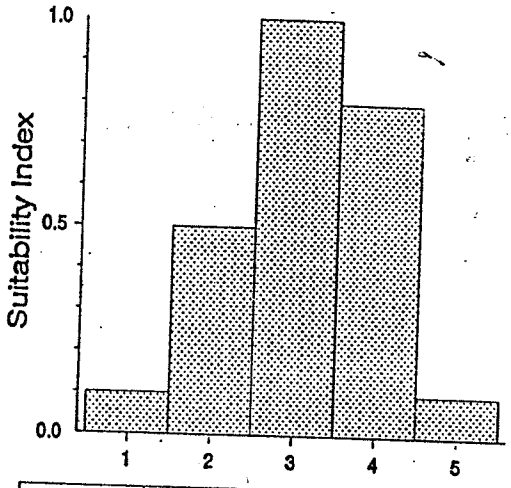
If mean stream depth is greater than 50 cm, divide the stream into fourths. Because fry occur mostly in the shallower sections, average the variables for the two shallowest fourths of the section to arrive at a mean value for each SI of the fry component. In streams shallower than 50 cm, simply average the entire stream.

V6: Mean column velocity for fry during base summer flow. Measuring at a point 0.6 x total depth from the surface approximates mean column velocity.



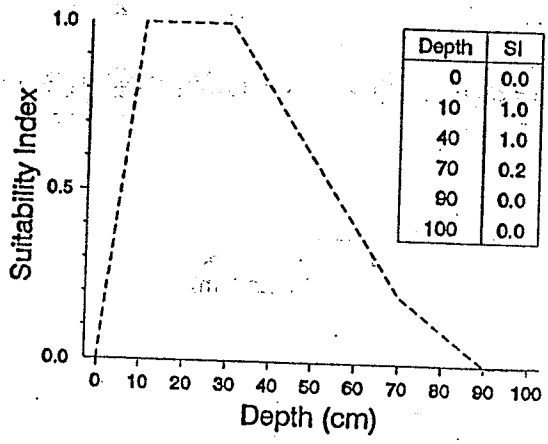
Velocity	SI
0	0.8
10	1.0
30	1.0
40	0.9
80	0.1
100	0.0

V7: Dominant substrate for fry.



Substrate Code	Substrate Type	Size (mm)	SI
1	Fines	< 0.5	0.1
2	Sand	0.5 - 2.2	0.5
3	Pebble-gravel	> 2.2 - 22.2	1.0
4	Cobble	> 22.2 - 256	0.8
5	Boulder	> 256	0.1

V8: Mean depth for fry during base summer flow.

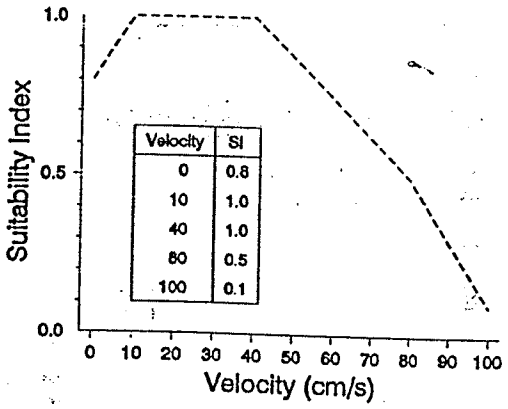


Depth	SI
0	0.0
10	1.0
40	1.0
70	0.2
90	0.0
100	0.0

Parr Component

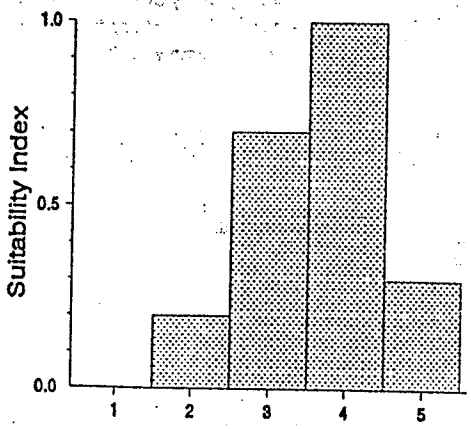
If mean stream depth is over 50 cm, divide the stream into fourths, and average the variables in the two deepest fourths to arrive at the mean value for each SI. In streams shallower than 50 cm, use the mean values for the entire stream.

V9: Mean column velocity for parr during base summer flows.



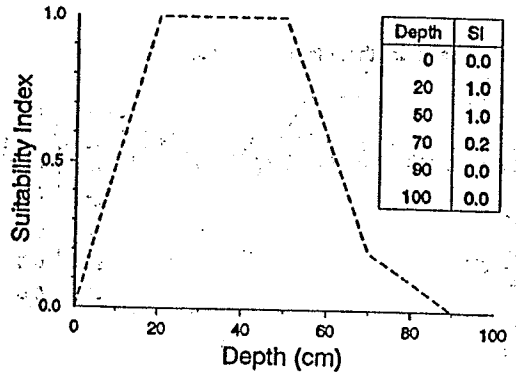
Velocity	SI
0	0.8
10	1.0
40	1.0
80	0.5
100	0.1

V10; Dominant substrate for parr.



Substrate Code	Substrate Type	Size (mm)	SI
1	Fines	< 0.5	0.0
2	Sand	0.5 - 2.2	0.2
3	Pebble-gravel	> 2.2 - 22.2	0.7
4	Cobble	> 22.2 - 256	1.0
5	Boulder	> 256	0.3

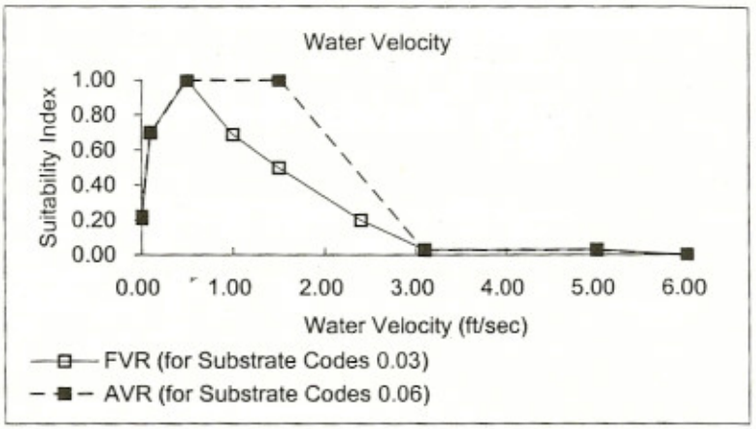
V11: Mean depth for parr during base summer flows.



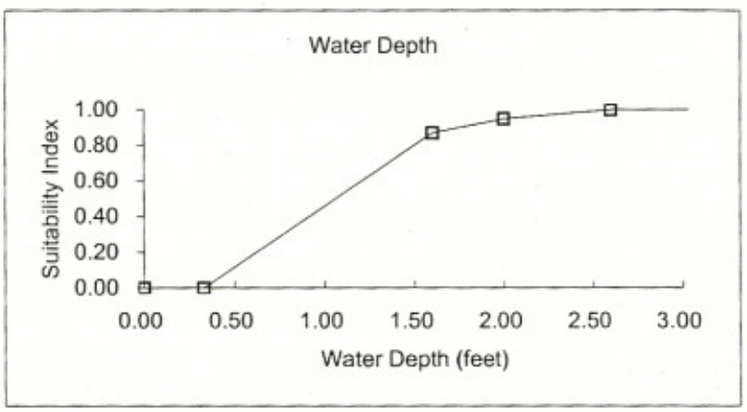
Depth	SI
0	0.0
20	1.0
50	1.0
70	0.2
90	0.0
100	0.0

Species: Brown Trout
Lifestage: Adult (Few and Abundant Velocity Refuges)

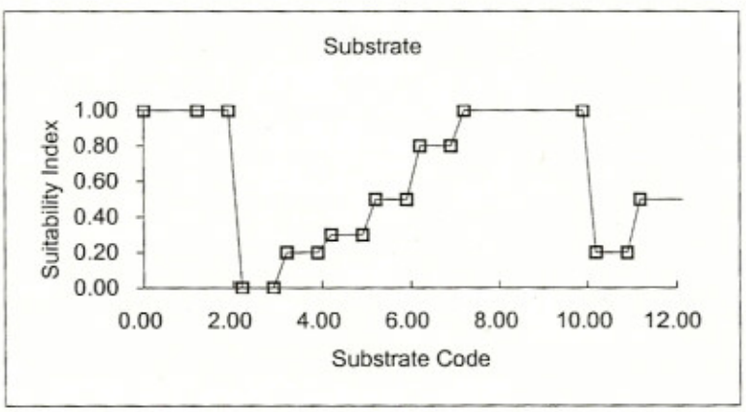
Few Velocity Refuges		Abundant Velocity Refuges	
Velocity	SI Value	Velocity	SI Value
0.00	0.21	0.00	0.22
0.10	0.70	0.10	0.70
0.50	1.00	0.50	1.00
1.00	0.69	1.50	1.00
1.50	0.50	3.10	0.03
2.40	0.20	5.00	0.03
3.10	0.03	6.00	0.00
5.00	0.03	100.00	0.00
6.00	0.00		
100.00	0.00		



Depth	
Depth	SI Value
0.00	0.00
0.33	0.00
1.60	0.87
2.00	0.95
2.60	1.00
100.00	1.00



Substrate	
Substrate	SI Value
0.00	1.00
1.20	1.00
1.90	1.00
2.20	0.00
2.90	0.00
3.20	0.20
3.90	0.20
4.20	0.30
4.90	0.30
5.20	0.50
5.90	0.50
6.20	0.80
6.90	0.80
7.20	1.00
9.90	1.00
10.20	0.20
10.90	0.20
11.20	0.50
100.00	0.50

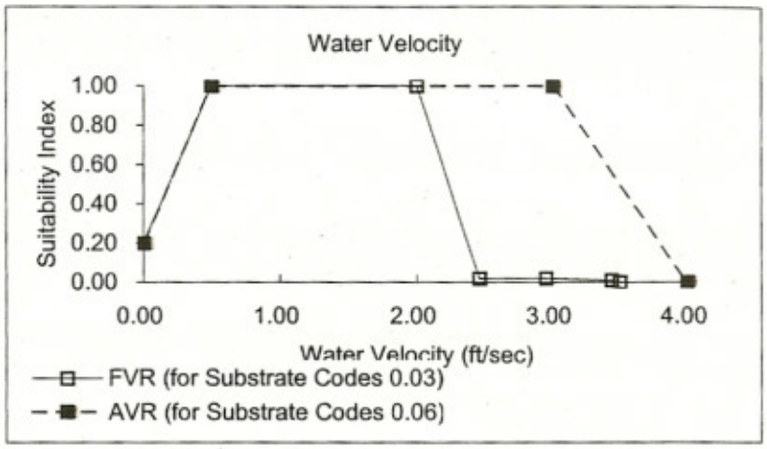


Note: This SI curve does not show embeddedness because it is not related to habitat quality.

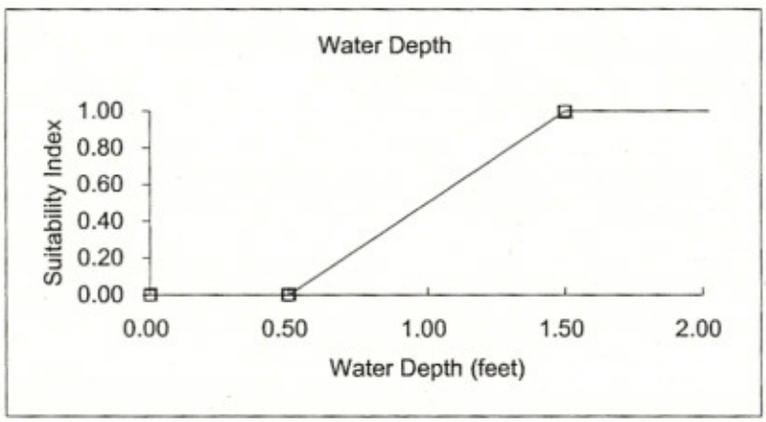
Reference: USFWS "Bluebook", modified for Deerfield River study (1991).

Species: Rainbow Trout
Lifestage: Adult (Few and Abundant Velocity Refuges)

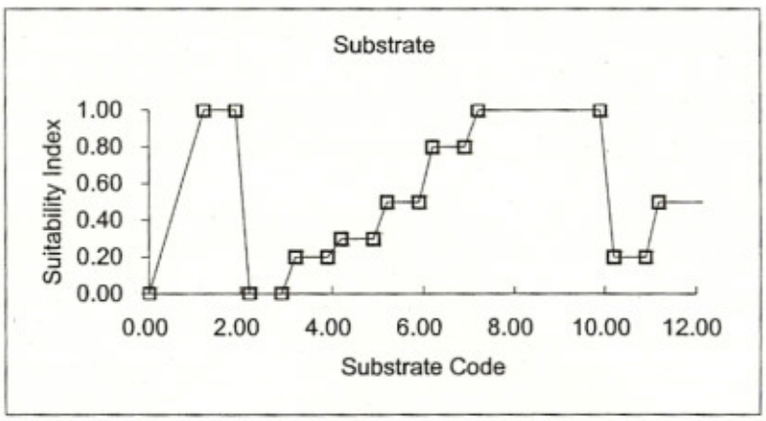
Few Velocity Refuges		Abundant Velocity Refuges	
Velocity	SI Value	Velocity	SI Value
0.00	0.20	0.00	0.20
0.50	1.00	0.50	1.00
2.00	1.00	3.00	1.00
2.46	0.02	4.00	0.00
2.95	0.02	100.00	0.00
3.44	0.01		
3.50	0.00		
100.00	0.00		



Depth	
Depth	SI Value
0.00	0.00
0.50	0.00
1.50	1.00
100.00	1.00



Substrate	
Substrate	SI Value
0.00	0.00
1.20	1.00
1.90	1.00
2.20	0.00
2.90	0.00
3.20	0.20
3.90	0.20
4.20	0.30
4.90	0.30
5.20	0.50
5.90	0.50
6.20	0.80
6.90	0.80
7.20	1.00
9.90	1.00
10.20	0.20
10.90	0.20
11.20	0.50
100.00	0.50



Note: This SI curve does not show embeddedness because it is not related to habitat quality.

Reference: USFWS "Bluebook", modified for Clyde River study (1991).

CENTRAL VERMONT PUBLIC SERVICE CORPORATION
LAMOILLE RIVER INSTREAM FLOW STUDY
SUBSTRATE CODING SYSTEM

Substrate Codes:

1- Roots, Snags, Undercut Banks, Overhead Cover
2- Clay
3- Silt
4- Sand
5- Small Gravel (< 2")
6- Gravel (2"-4")
7- Cobble (4"-10")
8- Boulder (10"-2')
9- Boulder (>2')
10- Ledge
11- Detritus, Vegetation

Percent Embeddedness Codes:

.2 - 0-25% Embeddedness
.5 - 26-50% Embeddedness
.7 - 51-75% Embeddedness
.9 - 76-100% Embeddedness

Embeddedness = Amount of fine material in interstitial spaces

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Cover Codes:

0.03 Cover- Few Velocity Refuges
0.06 Cover- Abundant Velocity Refuges

where Abundant Velocity Refuges are defined as: Large Boulder >25% or,
Small Boulder >75% or,
Instream Structural Cover >50%
